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INCLUDING

PAKISTAN, CEYLON, BURMA AND MALAYA

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EDITED BY LT.-COL. R. B. S. SEWELL, C.I.E., Sc.D., F.R.S., I.M.S. (*retd.*)

COLEOPTERA

LAMELLICORNIA

LUCANIDÆ

AND

PASSALIDÆ

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VOL. IV.

BY

G. J. ARROW

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EDITOR'S PREFACE

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It is deeply regretted that the Author of this volume, Mr. G. J. Arrow, died before the volume could be published. The manuscript of the work was first sent to me for publication in 1943, but war and post-war conditions made it impossible to print and publish the volume earlier. Fortunately Mr. Arrow was able, before his death, to revise his manuscript and go through the type while it was in galley-proof. It is therefore hoped that few errors or misprints have crept in: but should there be any, I must bear the responsibility for them.

Zoologists the world over will learn with great appreciation that the Government of India have undertaken to continue the Series. The grant of full autonomy to India and the separation of the Dominion of Pakistan have, however, rendered necessary a change in the title of the Series, and in future this will be "The Fauna of India" and each Monograph will include an account of the faunas of India, Pakistan, Ceylon and Burma, and, if possible, Malaya. The Government of India have further decided that from now on all future volumes must be printed and published in India. The present volume thus concludes a long stage in the production of this valuable series of Monographs: the first volume, that on the Mammalia, by W. T. Blanford, was printed by Messrs. Taylor & Francis, Ltd. in the year 1888, and since then 81 volumes have been issued. With the publication of this volume the long association of Messrs. Taylor & Francis, Ltd. with the "Fauna of British India" comes to an end, and I therefore take this opportunity of expressing to them the very great

degree of indebtedness that I and previous Editors and Authors owe to them, for the very great care that they have throughout taken in the printing of these numerous volumes and for the manner in which the standard of work has been maintained for over sixty years.

R. B. SEYMOUR SEWELL,
C.I.E., Sc.D., F.R.S.,
Lieut.-Col. I.M.S. (*retd.*),
Editor.

THE ZOOLOGICAL LABORATORY,
CAMBRIDGE.
May, 1949.

PREFACE

——o——

The groups of Lamellicorn beetles comprised in the four volumes published between 1910 and the present time, and in the present volume, which is the last, have not followed any natural sequence, but have been dealt with only as the materials necessary for the purpose have been found adequate. The largest subfamily, the Melolonthinæ, the very great majority of the types of which are in Germany, has been omitted for reasons which it is perhaps unnecessary to explain. The preparation of the present volume has been made possible by willing help from many kind friends, who have allowed me to study at leisure the specimens in their charge and, in too many cases, to retain them for a very long time. Through their co-operation I have been able to examine type-specimens of nearly every species, known to inhabit India or Burma, of the two families dealt with here. For this I must acknowledge my indebtedness in the first place to two old and lamented friends, ardent entomologists and earnest workers for international goodwill in two once-friendly nations which, it is to be hoped, may in time to come prove worthy of such citizens, the late Dr. Walther Horn, of the Deutsches Entomologisches Institut, Berlin, for the loan of the types of Kraatz, Zang and others preserved in that institution, and the late Dr. R. Gestro, of the Museo Civico di Storia Naturale in Genoa, for the loan of Boileau's Burmese types. Dr. Gestro's assistant, Dr. Capra, and his successor, Dr. Oscar de Beaux, have also given all possible help, for which I desire to express my gratitude.

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Even more important has been the assistance rendered by my very old friend, Monsieur René Oberthür, whose death in 1944, at the age of 92, has deprived us of perhaps the most zealous and stimulating collector of Coleoptera the world has known. His constant interest and encouragement during the progress of the present work and the loan or presentation of the numerous types from his wonderful collection, have been of immense value. Others, to whom I also offer my grateful thanks, include Dr. R. Didier, who has lent me types of species described by himself and Boileau, since presented by him to the Paris Museum, Professor G. D. H. Carpenter, of the Hope Department of the Oxford University Museum, for putting at my disposal the many types of Hope and Westwood under his charge, Dr. Hem Singh Pruthi, formerly of the Calcutta Museum, for sending me those of Gravely contained in that collection, and Herr Paul Nagel, of Hanover, for obtaining for me from the Hanover Museum the highly interesting type of *Lucanus gracilis* Albers.

Many others have helped me by the loan of specimens, and I wish to acknowledge my indebtedness to Dr. C. F. C. Beeson and Mr. J. C. M. Gardner, of the Forest Research Institute, Dehra Dun, Mr. G. M. Henry, of the Colombo Museum, Mr. E. A. D'Abreu, of the Central Museum, Nagpur, Mr. S. H. Prater, of the Bombay Natural History Society, Monsieur Antoine Ball, of the Royal Museum of Natural History, Brussels, Mr. E. R. Leach, of Piedmont, California, and Mr. J. W. Angell, of New York. The collections made in India by Mr. T. R. D. Bell and Mr. H. G. Champion have also been of important assistance.

In no other group of insects, perhaps, does an adequate conception of the differential characters depend to a greater degree than in the Lucanidæ upon a comparison of many specimens. Published descriptions consist, in most cases, of a more or less exact enumeration of the features of a single specimen. When this is a female, such a diagnosis applies with considerable accuracy to any other specimen of the species belonging to the same sex, but when, as is more often the case, the specimen described is a male, it may well be that another specimen of either sex, although of the same species, will

accord with it in scarcely any single detail. The extreme variability of male LUCANIDÆ is the cause of exceptional difficulty in identification and, as a result, the nomenclature of the group is greatly complicated. Only the study of series sufficient to link up the different phases can resolve the numerous problems that arise. Since many Indian species are still known by only a very few examples, or even a single one, it cannot be hoped that finality in nomenclature has been achieved in this work. The present attempt, with its rather extensive revision of antecedent work, will itself inevitably need revision when further materials have accumulated. It may at least be hoped that this volume, by bringing together the very scattered records in comprehensive form, will serve to stimulate interest in a very remarkable and attractive group of insects.

To illustrate with anything like completeness insects so variable as the LUCANIDÆ would require figures of many examples of each. Such series, in very many cases, are not at present to be found in any collection, and I have been obliged to content myself with one figure of nearly every species of both sexes of a considerable number and of more in a few representative cases only. The photographs, with a few exceptions, are of the exact size of the originals and in many cases are of type-specimens, either so designated by the author of the name or one of the original series from which the species was described. The figures not of the actual size of the specimens are indicated in the "Explanation of the plates".

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INTRODUCTION

LUCANIDÆ and PASSALIDÆ

The LUCANIDÆ and PASSALIDÆ form, with the SCARABÆIDÆ, the immense Suborder (or Superfamily) Lamellicornia. Being relatively small groups which number together only a fraction of the number of species comprised in the SCARABÆIDÆ, it is natural to treat them together, but it must not therefore be inferred that they are actually related very closely. Although at one time it was customary to unite them in a separate group (called the Pectinicornia) they are more naturally included in the great Lamellicorn group.

In many respects the two families differ greatly in both larval and adult stages, the contrast being very great in the larvæ. Those of the LUCANIDÆ have the same general form as those of other Lamellicorns, and like these normally lie upon the side, the body curved like the letter C, with the three pairs of legs lying close together inside the curve. Passalid larvæ have the body comparatively straight, there are only two pairs of functional legs and they are widely separated. The third pair are represented by vestiges so minute that they are almost invisible without magnification. They lie close behind the second pair, have lost all trace of their original form as organs of locomotion and apparently serve only to scrape microscopic ridges upon the surface beneath them, the friction causing a squeaking noise. Lucanid larvæ also squeak by means of a special apparatus upon the two hinder pairs of legs but all the legs are fully developed, as in other Lamellicornia.

In the adult beetles there is a very strong contrast between the uniformity of the PASSALIDÆ and the variety of the LUCANIDÆ. The former are shining black insects, narrow-bodied, parallel-sided, with short legs and antennæ. The latter may be black and shining but they are often brown, red or yellow; they may display boldly contrasted combinations of light and dark colours or even (though not in India) the most vivid metallic green, golden or fiery red. They may be narrow but are sometimes extremely broad. The legs and antennæ may be short but are often very long. In structural details the two groups have little in common except such as are shared with nearly all Lamellicornia. In the PASSALIDÆ the connection between the front and hind body is very

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peculiar. The mesothorax is lengthened in such a way as to form a waist such as few other beetles possess. The mesonotum does not project between the elytra, and the bases of these do not, as usual, fit closely against the pronotum. As a consequence of the elongated mesothorax the second pair of legs is capable of swinging forward into a position close to the axis of the body, impossible to most other beetles. The organs of the mouth are also entirely different in the two families. Those of the PASSALIDÆ form a very strong masticatory apparatus for dealing with woody material, while those of the LUCANIDÆ are adapted for juicy or liquid nourishment and of a much more delicate character, their mandibles not being employed for mastication.

Another great contrast between the two groups is found in the usually very different males and females of LUCANIDÆ and their always identical form in PASSALIDÆ. A characteristic of Lamellicornia in general is the tendency for the two sexes to show considerable differences in form and colouring. The most striking manifestation of this is in the appearance of horns, either peculiar to the males or reaching an exaggerated development in that sex. These horns are either outgrowths of the head or thorax or greatly elongated mandibles. The most remarkable examples of the former type are found in the DYNASTINÆ and COPRINÆ, already dealt with in former volumes of this series, and of the latter type the most striking examples occur in the LUCANIDÆ. A few cases of this type have been described and figured in the volume on RUTELINÆ (*Didrepanephorus*, *Dicaulocephalus*, etc.), and a similar enlargement of the mandibles of the males is met with in particular instances in many families (CERAMBYCIDÆ, BRENTHIDÆ, HISTERIDÆ, etc.). But the LUCANIDÆ are not only the best examples amongst insects of the enlargement of the male mandible—they are probably unique in exhibiting a high degree of sexual dimorphism in the great majority of the species. In other instances it is observable that these differences between male and female are of very irregular occurrence. They may be found in a single species, in several or in many, but closely related forms are almost invariably found in which they are absent. Usually they are found in the largest forms of a group and smaller closely related forms are without them. In the LUCANIDÆ also they reach their highest development in large species and are absent in certain small forms, but those in which the two sexes are actually alike are so few as to be comparatively unimportant.

The PASSALIDÆ, on the contrary, are conspicuous amongst the Lamellicornia for the complete absence of external differences between male and female. Living in similar conditions and, like the LUCANIDÆ, feeding in the larval stage in and

upon decaying tree-stumps or logs, they are strikingly different from them in this respect and in the absence of that extreme variability of size within the species so characteristic of the Lucanidæ.

Like the Coprinæ, dealt with in a previous volume, both groups may be regarded as on the whole beneficial to mankind. None are recorded as injurious to any serious extent, and, as the result of their combined activities, great quantities of dead tree-stumps and logs are disintegrated and removed, which would otherwise remain to hinder the growth of fresh vegetation. It can perhaps scarcely be counted as a further merit that certain native races attribute peculiar virtue to the strange-looking male beetles. I have been informed by Dr. Hamid Khan that in Southern India certain hill-tribes use the mandibles medicinally, and of a certain Chinese species, *Calcodes nitidus*, the form of the male mandibles is unknown, every specimen brought to Europe having had them removed, probably for a similar reason.

Larvæ.

As already stated, the larvæ of the two families differ very considerably, those of the Passalidæ being adapted to a more active existence than those of the Lucanidæ, which, like Lamellicorn larvæ in general, have very little power of movement from place to place. The Lucanid larva differs little from other "white worms," as Lamellicorn grubs are called in various parts of the world. The body is curved into the shape of the letter C and normally lies upon its side, the three pairs of legs brought close together and useless for locomotion, although well developed. The surface of the body is rather smooth, the segments being without transverse folds and with little or no covering of hairs or spines. The 4 or 5 segments forming the posterior half of the body are large and the anal opening, which in other Lamellicornia lies in the same plane as the mandibles and other organs of the mouth (generally described as transverse), is here at right angles to that plane (generally described as longitudinal). This serves to distinguish at a glance any larva belonging to the family, at least so far as they are at present known. The ventral surface of the last segment, as in other Lamellicornia, has on each side a patch of very short close-set spines, forming what is sometimes called the raster; the exact arrangement of these spines differs in different species. The spines probably serve to assist the mandibles in holding food-matter or perhaps in cleaning the delicate organs of the mouth.

The legs consist of a coxa, trochanter and two other joints, terminating in a single claw. All the legs are of nearly equal length, but those of the third pair have an extension of the

trochanter, and the inner side of that joint usually bears a hard straight ridge extending from its base to the tip of this projection. Highly magnified, this ridge is found to be transversely broken up or milled, like the edge of a coin. The leg is usually directed a little forward, so that the ridge, which is used like a violin bow, rests upon the base of the leg in front of it. The coxa of that leg is crowded with hard granules, so that it may be compared to sand-paper, and the effect of drawing the sharp transverse blades of the "bow" across this plate is to set up vibrations which produce a fairly high-pitched note. The granules upon the middle coxa have a definite arrangement which varies according to the species. The structure found in the European representatives of the genera *Lucanus* and *Dorcus* are shown in the beautiful plates of the Danish work on beetle larvæ (Schiodte—De Metamorphosi Eleutheratorum Observationes). In *Lucanus* the outer edge of the granular area is formed by a single row of larger elevations placed side by side. In *Dorcus* the arrangement does not differ greatly, but certain other forms less nearly related show well-marked differences in the distribution of the granules. In some these form rows instead of being distributed over the whole surface. In a recent paper (Stett. Ent. Zeit., vol. xcvi, 1935 p. 178) Dr. van Emden has described the distinctive features of the larvæ of a number of different genera and Mr. J. C. M. Gardner (Indian Forest Records, vol. i, 1935, p. 6) has compared various Indian larvæ identified as belonging to *Dorcus*, *Hemisodorcus*, *Prosopocœlus* and *Eurytrachelus*, which he says "might all belong to one genus," thus confirming the view taken in the present work. A few other Indian larvæ have been described by Dr. Gravely (Records of the Indian Museum, vol. xii, 1916, p. 137). In the genera *Ægus* and *Nigidius* the stridulatory surface is less well developed and it seems doubtful if the apparatus is actually functional.

Passalid larvæ also are rather smooth, the body-segments being without the transverse folds found in most Lamellicorn larvæ, but, in marked contrast, not only with the Lucanidæ but with all other known Lamellicorns, they are active creatures, able to crawl from place to place. The body is comparatively long and straight, the ten abdominal segments are alike, the posterior ones not enlarged, and the terminal one is without the usual spiny "raster" on its lower surface. The anal opening has the normal transverse direction, unlike that of Lucanidæ. The most remarkable characteristic is in the legs, which appear to be only four in number. A very close examination is necessary for the detection of the tiny hind legs, seemingly rudimentary, which do not project downwards but lie close to the sides, where they extend only as far as the bases of the second pair. When magnified these minute

limbs are seen to have the shape of a tiny hand or paw with five or six projections very sharply pointed at the end. The area at the base of the preceding leg, upon which this curious limb lies, is darker than the surrounding surface and, closely examined, is found to bear a number of very fine ridges, capable of vibrating when plucked by the claws of the little "paw." To human ears the sound so produced, as it has been described by Ohaus, is soft but easily audible at a short distance. The four normal legs are rather long and slender.

A small distinctive feature of the Passalid larva in its early stage is a pair of hatching-spines or egg-bursters. These are sharp projections found one on each side of the upper surface of the metathorax. They serve to break the egg-shell and are shed when the first skin is cast.

The distinctive features of a number of Indian species of PASSALIDÆ have been described by Dr. Gravely in the paper mentioned above. The larvæ of the AULACOCYCLINÆ and of *Leptaulax* can be distinguished, according to him, from those of the remaining Indian genera by the form of the terminal lobe of the last ventral segment, which is deeply cleft, whilst in the rest it is entire.

The organs of the mouth do not greatly differ in Lucanid and Passalid larvæ, but Gardner (Indian Forest Records, vol. i, 1935, p. 2) has recorded that the grinding apparatus of the mouth in the latter is reduced, as compared with that of the Lucanid larva, and says "the difference would be difficult to explain were it not for the observations of Ohaus, who found that . . . the parent beetles attend their progeny throughout their larval period and present them with already masticated food."

The larval period appears to be much shorter and the adult life longer than in the LUCANIDÆ. The eggs do not all mature together, but seem to be laid at intervals during several months. In the case of *Passalus cornutus* eggs, larvæ and pupæ were all found together and the complete metamorphosis appears to be accomplished in the course of a single summer.

Another Lamellicorn group in which stridulation by the larvæ is performed in a similar way to that adopted by the LUCANIDÆ and PASSALIDÆ is that of the GEOTRUPIDÆ. In that group the larval legs are to some extent intermediate in their stage of development between the conditions found in our two families. The third pair are specially adapted for scraping the bases of the second pair and are reduced in size, but without the very great degree of specialization found in the PASSALIDÆ. Although the short, compact-bodied adult GEOTRUPIDÆ have little resemblance to either LUCANIDÆ or PASSALIDÆ, there are many reasons for regarding them as a primitive group related to the ancestors of both. Larval

stridulation may therefore be regarded as a habit acquired in very ancient times, before the separation of these three now very distinct groups of beetles.

Habits and Metamorphoses.

With the exception of the Lucanidæ belonging to the genus *Colophon* in South Africa, which apparently feed upon the roots of scrubby mountain plants, of the remarkable blind *Vinsonella cæca* in Mauritius and of *Leptinopterus* in South America, one of which has also been found among roots, the members of these two families, so far as they are known, feed upon decaying wood and are found during the greater part of their lives in rotting logs or tree-stumps. Cocoons of a Lucanid, probably *Calcodes siva*, have been recorded (Sharp, Proc. Ent. Soc. 1884, p. 18) as found in the thatch of a house in Assam, but there is no evidence that this substance is a food material of that common species. More probably the larva fed upon the supporting timber. Although, in the nature of their food, Lucanidæ and Passalidæ are alike, their life-histories are actually very different. Upon reaching maturity the Lucanidæ, as their mouth-organs clearly show, are no longer capable of feeding upon wood. Many appear to take only liquid food, some others are said to attack foliage. The Passalidæ on the other hand are without apparent means of taking liquid nourishment but have strong horny jaws well adapted for masticating the woody substance of the dead stumps and logs in which they live in all their stages. They are more social in their mode of life than the Lucanidæ, larvæ and adults being commonly found together. Observers both in Tropical America and in the East have reported the discovery of communities, each consisting of two adult beetles and a group of larvæ, and this has given rise to the supposition that the young are fed and cared for by their parents. This was the conclusion arrived at by Dr. Fritz Ohaus, who devoted some time to a study of several species found by him in South Brazil. An account of his experiences, of which the following translation forms part, was published in the Stettiner Entomologische Zeitung for 1900 (Bericht über eine entomologische Reise nach Centralbrasilien, p. 164).

" Since Passalidæ were common at Petropolis—I found altogether more than 30 species and about 15 genera—and on every excursion I found numerous larvæ, I tried several times to breed them like other Lamellicorn larvæ, but always with the same want of success. This surprised me the more since the other larvæ prospered quite well in similar circumstances . . . I now turned my attention for some time almost entirely to this group and soon observed that in all the tree-trunks in which I found Passalid larvæ they were accompanied

by two adult beetles, occupying the end of the gallery, which was largely filled with pulverized wood, often boring further into the wood, while close behind them were the larvæ, varying in number from 2 to 7, sometimes in pairs and sometimes scattered. I now put the larvæ found in a single trunk into a breeding-cage together with the two beetles and found that they prospered quite well. If I removed the two beetles the larvæ died, even if I gave them the food-material chewed by the beetles confined separately. As I frequently observed both in the field and at home, the larvæ ate only the wood chewed by the beetles. If I took a larva from its burrow and examined its mouth-parts I always found between them only spongy chewed woody material and never separate pieces such as one always finds between the jaws of larvæ of Lucanidæ, Rutelidæ, Dynastidæ and Cetoniidæ. If one carefully examines the mouth-organs of a Passalid larva, one finds that they are not of a kind to masticate the wood in which one finds them. The mandibular teeth are comparatively feeble and the grinding surfaces at the base are both concave, without ridges for mastication, and lie so far apart that their edges are not in contact; moreover, the lower lip is without the chitinous piece on the inside, the hypopharynx, which is found in all wood-eating Lamellicorn larvæ and which serves to grind still smaller the wood which has been partly divided between the molar surfaces. The maxillary teeth can only grip and not masticate the food.

The operations of the pair of beetles found together with the larvæ are, however, not confined to masticating their food, for if one gives the larvæ the pulverized wood gnawed by the beetles removed from them, or that taken from the burrows of other Lamellicorn larvæ found in the same stump (*e. g.* Rutelid or Cetoniid larvæ) the larvæ die nevertheless. Although I could not investigate the chemical constitution of the digestive secretion in the moist woody substance eaten by them, I consider it certain that the food of the larvæ is predigested by the beetles. The brevity of the digestive tract in Passalid larvæ is confirmation of this. In them the enlargement of the last abdominal segment characteristic of all other Lamellicorn larvæ, including those of Lucanidæ, is entirely wanting.

Examination of the internal organs of the two beetles found with the larvæ always proved them to be a pair, the parents of the larvæ, as further observation soon showed. A pair gnaw their way into a suitable stump. They are not particular in their choice, one finds few old stumps near Petropolis without *Passalus*; they attack any kind of wood, provided it is sufficiently decayed and quite moist. The burrows, which are so wide that both beetles can work in

them close together, run in all directions in the wood, not under the bark, and are filled with gnawed wood. In this the female lays her eggs in a heap. The eggs are olive-green in the small species, blackish-green in the larger ones, almost spherical, with a rather hard elastic shell. The egg does not increase in size after it is laid. At the end of the egg-stage, the duration of which I could not judge, the shell splits from one end to the other, gapes wide open, like the two husks of a hempseed, and from it crawls the white larva, of which the tips of the mandibles, the tarsi, and the spiracles and stiff bristles on the back are yellow. During this movement it increases considerably in size; for instance the larva of *Phoronæus rusticus* Perch., emerging from an egg 5·5 mm. long, was 13·5 mm. long and 3·25 mm. broad. The adults remain with the eggs and young larvæ until all the eggs are hatched. Then new burrows are started and, the parents in front and their brood behind, the whole company advance, chirping all the time . . . The sound produced by the stridulating apparatus is loud and penetrating. The beetles in a fallen log can be heard before they are seen. In a specimen found late at night, which in the absence of any better vessel, I enclosed in a china receptacle on the washstand, the noise was so loud that I could not sleep until I had removed it from the room. The beetles chirp whether their brood is with them or not; but that they communicate in this way with their brood I satisfied myself when I once found a log containing Rutelid larvæ and pupæ as well as Passalidæ, old and young. As the former were of more interest to me, I put the latter aside about half a yard from the log. During my search for the Rutelidæ, I heard the continuous chirping of the Passalids. When I had thoroughly searched the log and, before departing, turned over a large piece of wood lying near, I found beneath it the parent beetles and four larvæ. Two others were making for the same shelter over fragments of wood and other obstacles . . .

The chirping of the larvæ is not so loud as that of the beetle, but distinctly audible, especially that of the larger species. The larva is quite active and is even able to climb up rough surfaces and the wire gauze of a breeding-cage. I have never observed that, even when of different species, they bite one another, nor did I ever observe the moulting process. The entire development occupies barely a year, even in the large species—in *Paxilloides* there are two generations in a year. For pupation the larva needs no cocoon, the pupa usually lying free in the burrow, the loose woody material merely drawn a little towards its sides and occasionally lightly cemented together to form a frail cocoon. The change from larva to pupa and from pupa to beetle takes about 3 weeks, so

that it is hardly possible to determine the intermediate stages, especially as larvæ and pupæ do not stand disturbance so well as those of Rutelidæ for instance. The parents remain with their brood until all have pupated and with the pupæ until these have become adult and must even attend to the freshly developed beetles, which take some time to become hardened and their organs so fully mature that they are able to feed themselves. In January and February complete families are commonly found together still, even close together in the same gallery, the elders only distinguishable from the young by the worn teeth of the front tibiæ, scanty hair, missing tarsi, etc. . . .

Common as the beetles are in old timber, one rarely sees them in the open ; I believe there were not half-a-dozen times when I found individuals upon the ground or crawling on old logs in the forest. Usually one finds only one family in a tree-trunk, often together with larvæ of other Lamellicornia, but rarely are several families of a species together and I never found different species in company. I only once saw a Passalid in flight—the flight is slow and heavy."

W. M. Wheeler, in his book upon ' The Social Life of Insects ' (1923, p. 27), states that his own observations, made in Central and South America, Trinidad and Australia, confirm those of Ohaus, and I have been informed by a well-known entomologist, Col. F. C. Fraser, that he has on various occasions found in India Passalid families consisting of two adults and a number of larvæ. The precise interpretation of the facts observed must, however, be regarded as not yet finally settled. In a careful review of the subject (' Uber die Biologie der Passaluskäfer '), R. Heymons, who studied the insects in the same regions as Dr. Ohaus, contends that there is no reason to believe that parental care is actually exercised or that the life-history of these insects differs in any important respect from that of other wood-feeding beetles. From an investigation of the contents of the alimentary canal he concluded that the larvæ were capable of assimilating and digesting woody material in the raw state, and were not, as supposed, dependent upon predigested food. Heymons' observations relate chiefly to *Passalus interstitialis* in South Brazil. Experiments with the North American species, *Popilius disjunctus* Ill. (=*Passalus cornutus* F.), made by a group of students of Duke University, North Carolina, and described by them in ' The Ecology of *Passalus cornutus*, Fabricius, a beetle which lives in rotting logs,' by A. S. Pearse, etc. (Ecological Monographs, 1936, p. 455) led to the conclusion that, although well-grown larvæ could be reared independently upon rotting wood, young newly-hatched specimens required material previously dealt with by the

adults. When separated from the latter in an early stage they invariably died.

The question of parental care must therefore be regarded as needing further investigation. It seems certain that the young larvæ depend for a time, at least, upon food material prepared by the adults. The degree of dependence no doubt varies in different species and genera. The larva differs greatly from those of all other Lamellicornia and the existence side by side of larvæ and adults is highly exceptional and must have some special significance. It occurs also in the "Ambrosia-beetles" (PLATYPODIDÆ and SCOLYTIDÆ) in which a social organization varying in its degree of complexity has been found to exist.

Whether or not the stridulatory power of the adults and young is used as a means of inter-communication, as Ohaus maintained, the possession of the faculty so highly developed in both throughout the family seems to indicate a greater importance than it has in any other group of beetles, for in general the occurrence of these organs is rather erratic. The profound structural modifications by which the stridulatory organs have become perfected also show this. Owing to the complete transformation of the third pair of legs of the larvæ into stridulating organs the creatures have acquired a method of locomotion by two pairs of legs only which is quite unlike that of other insect larvæ. In the adults flight is evidently of less importance than stridulation, for in a number of different species the alteration of the wings, the rubbing of certain specialized parts of which, by bosses situated upon the abdomen, produces the squeaking sound, and the fusion of the edges of the elytra, against which the wings are pressed, has resulted in the complete loss of all power of flight. As to the real use of stridulation, further investigation is much to be desired. In a paper dealing with 'The Origin of Stridulation in Beetles' (Proc. R. Ent. Soc., A. 17, 1942, p. 83), I have suggested the possibility that the vibration resulting from the movements may serve as a protection against predators or parasites, the sound being only incidental.

Social instincts of an elementary kind have been found to exist in at least one member of the LUCANIDÆ, the European *Sinodendron cylindricum*. The late Dr. T. A. Chapman described (Ent. Month. Mag. vol. v, 1868, p. 139) his discovery of this insect in the process of nidification. A burrow about 6 inches long, with shorter branch-tunnels, was driven into the dead and rotten wood of an old ash tree by a pair of beetles working in collaboration. The excavation was begun sometimes by the male and sometimes by the female but soon after a pair were found at work together, the female extending the burrow while the male appeared to employ himself by removing the excavated material. Widenings of the burrow

occurred at intervals, enabling the insects to turn round. In the branch-tunnels eggs, 20 or more in number, were laid at regular intervals of about one-eighth of an inch in a spiral line round the wall, each in a slight depression, and the chamber was afterwards packed with wood dust. Each grub, on hatching, bored straight into the wood, the mother-beetle remaining in the main burrow. It is probable that the mother usually dies near the entrance to the workings and so bars the way to any insects seeking to prey upon her brood.

It has been stated by Ratzeburg (Die Forstinsekten, vol. i, 1837, p. 106), that the male and female of a *Dorcus* (the European *D. parallelopipedus* L.) work in association, but this has never been confirmed. It is very likely that such collaboration will be found to occur in Lucanid genera, such as *Figulus* and *Nigidius*, in which, as in the PASSALIDÆ, the two sexes are alike and there is no extravagant enlargement of the mandibles of the male. It is significant that the genus *Sinodendron*, which contains only three known species, is quite unlike all other LUCANIDÆ in having the mandibles of the male very small and the head and thorax provided with horns similar to those of dung-beetles, *Copris*, etc., in which nidification by the male and female working in co-operation is well known. The thoracic horns in *Sinodendron*, as in many COPRINÆ, have become specially modified to adapt them to the purpose of removing excavated material and débris from the burrow.

The LUCANIDÆ have been charged with the destruction of living trees, but without adequate reason. In his 'Report on Insects destructive to Forests,' Thompson stated "The Stag-beetles are both numerous and common in individuals and are, of the whole order of wood-beetles, the most destructive to living trees." According to E. P. Stebbing ('Indian Forest Insects') this statement was the result of confusion with another beetle (*Lophosternus*) belonging to the family CERAMBYCIDÆ; of the LUCANIDÆ Stebbing reports, on the contrary, "The tree selected (by the egg-laying female beetle) is invariably a dead one in which the wood has already undergone considerable decay. In no cases have I ever found the grubs or beetles in sound timber, nor have I been able to find any corroboration of the statement made by Thompson that these beetles and their grubs destroy oak timber."

Stebbing records, concerning *Lucanus lunifer* (Indian Forest Insects, p. 71), that fully developed larvæ, pupæ and mature beetles were all found in rotten oak stumps during July, and that the beetles are on the wing in June, July and September. The pupal stage lasts a month or six weeks at most, but the beetle spends some time resting before emergence. The female beetle lays her eggs in crevices of the bark or creeps

under projecting flakes and deposits them on the outer surface of the sap-wood. A little book, 'The Beetles of the Himalayas,' by E. A. D'Abreu mentions the trees most commonly affected, and the months of appearance of a few of the commoner Indian Stag-beetles. Beyond these scanty details scarcely anything has been recorded as to the habits of the Indian species, but the life-histories of the British *Lucanus cervus*, of which various congeners are found in India, and of *Dorcus parallelopipedus*, representing the predominant Oriental genus of LUCANIDÆ, are fairly well known. The eggs of the former are deposited in much-decayed tree-stumps or sometimes at the base of rotting oak posts. The species is common in the London district and the south of England, as well as in the outskirts of Paris. Its immature stages last three or four years and sometimes perhaps more but probably the duration of life of the related species inhabiting warmer climates is shorter. Like other Lamellicorn larvæ, that of *Lucanus cervus* feeds lying upon its side with the body curled in the shape of the letter C. When fully grown it prepares an oval cell with a smooth lining, within the soft fibrous substance surrounding it, and then turns upon its back to undergo its metamorphosis. The change to the pupal stage and later to the adult condition takes place in the autumn but the beetles remain until the following spring within the pupal cell and the eggs are laid in summer. *Dorcus parallelopipedus* is found in decaying stumps or trunks of ash and sometimes of elm, walnut, etc.

It is probable that the great majority of the Indian LUCANIDÆ have habits essentially similar to those of these European forms, to which they are closely related. A few, aberrant in their structure, like *Aulacostethus*, *Platyfigulus* and *Penichrolucanus*, have no doubt peculiar modes of life in correspondence with their structure, but of these a few solitary examples are all that have yet been discovered, and their habits remain completely unknown. Some of the Indian Stag-beetles are found in large numbers, but not a few are known only from single specimens, although in some cases these solitary specimens were discovered many years ago. It is probable that, like their European allies, most of the Indian species are more or less nocturnal in the adult stage, remaining quiescent during the day and becoming active only after sundown. Some of the more gaily coloured members of the family however, like the splendid Australian *Lamprima*, fly in hot sunshine and are sometimes seen in hundreds at a time. The common *Lucanus cervus* has occasionally appeared in very large numbers in Poland and other parts of Central Europe. A swarm drowned in the Baltic near Libau has been recorded and a still more remarkable swarm in the south of

France is said to have occurred some years previous to 1863, when, during a period of extreme drought, a cloud of the insects sufficient to obscure the sun passed southwards to a less arid region in the Department of the Pyrénées Orientales. The latter account, recorded by Planet in his 'Essai Monographique sur les genres Pseudolucane et Lucane' (p. 41), seems scarcely credible. Perhaps the finding of a few specimens of the Stag-beetle at the time of the passing of this surprising swarm led to a too hasty conclusion as to the insects composing it.

The active adult life of the Lucanidæ seems to be short. *L. cervus* appears at the end of May or the beginning of June, and is only occasionally seen after the middle of July. In the Himalayas various species are abundant during the months of July and August. Various accounts have been given of the contests that occur between the males of the British *Lucanus cervus*, which seem to considerably outnumber the females. Kirby and Spence describe them as attacking each other with great fury, but the encounters seem to be generally of a harmless nature, rather clumsy scuffles for possession of the female. It is very doubtful whether the mandibles can be correctly described as weapons in these struggles. The beetles appear to be actually without the means of inflicting injuries, such as often occur in similar contests between male insects not provided with enlarged mandibles. Certain species with shorter and stouter jaws are perhaps capable of inflicting more serious injuries but, although males are sometimes found bearing scratches, probably resulting from these contests, they are generally very superficial.

Dimorphism and Polymorphism.

Although the two sexes never differ so completely as in those insects the females of which are wingless and larva-like, sexual dimorphism seems to attain in the Lucanidæ almost the extreme of possible difference for beetles in which both sexes are fully developed. Male and female of the same species may be dissimilar in practically every respect, so that their correct association becomes a most perplexing problem. There are a few genera, e. g., *Figulus*, the species of which are of small size, in which the two sexes are alike externally but this is quite unusual. In other genera dwarfed males may rather closely resemble the females and such specimens often afford the best means of associating the sexes, but the larger the size of a male specimen the less it resembles the female, until in fully developed examples the dissimilarity may be complete, so that, in many cases, it is difficult to find any single feature alike in both.

Unfortunately a very considerable number of the genera hitherto accepted in this group are distinguished solely by peculiarities of the male and, in the case of females of which the other sex is not certainly known, not only must the species remain unknown but even a generic name cannot be supplied. Worse still, since the features distinctive of the male are inconstant and, with diminishing size, tend to fade away, such generic characters are often absent, not only in all the specimens of one sex, but in many of the other. It is obvious that, instead of facilitating it, such a system is a very serious obstacle to nomenclature. I therefore propose to recognize only genera in which distinctive features are to be found both in male and female. In groups of animals in which one of the sexes is rarely found or is rudimentary in character, it may be impossible to apply this rule, but in the LUCANIDÆ the two sexes are fully developed and approximately equal in numbers. The characters of the females are relatively constant and much more easily defined than those of the males, and experience shows that the features of most importance in classification are to be found in both sexes. When the male alone of a species has been known, a particular feature may have been quite reasonably supposed to be of generic importance ; but subsequent discovery that it is found in one sex only should be accepted as proving that assumption wrong.

In these beetles the feature that first strikes the eye is of course the enormous development of the mandibles, or "horns," of the males, which, in most species, differ *in toto* from those of the females. The mandibles of the latter are rather constant both in size and shape, obviously serving the same practical purposes throughout the group. They are short and sharp, the tips crossing one another, the outer edge simply rounded and the inner edge usually bearing a stout tooth for giving increased gripping power. The mandibles of the male, on the other hand, except in the few genera where the two sexes are alike and in a small number of exceptional species of other genera, such as *Dorcus derelictus* and *Lucanus gracilis*, in which the organs are little larger in the one sex than the other, convey no such suggestion of practical efficiency, in well-grown specimens at least. In many cases they reach a size (in *Lucanus cantori* and *L. laminifer*, Plate III, figs. 1 and 5, for example) which must inevitably restrict the freedom of movement of the bearers and exhibit fantastic shapes which, if we consider them as weapons or tools, suggest only a high degree of inefficiency. The great difference between the sexes in the mandibles entails other differences. The enlargement of the mandibles may be accompanied by a great enlargement of the head and often, as in the genus *Lucanus*, the head bears strong ridges or outgrowths which

give it a form entirely unlike that of the female. The enlargement of the head may entail the widening of the thorax in front. The great development of the anterior part of the body throws forward its centre of gravity and necessitates an adjustment of the supports, and the fore-legs are therefore relatively longer in the male. Various other differences are no doubt due to the different habits of the two sexes, the females being more sedentary and usually under the necessity of burrowing for the deposition of their eggs, while the males need no adaptation for that purpose and are more active. The legs of the females are accordingly stout and formed for digging, while those of the males are slender and sometimes extremely long.

In the genus *Lucanus* the contrast between the very elongate legs of the males and the short and powerful legs of the females is complete and an almost equally striking dissimilarity is found in many of the species of *Calcodes*. A curious exception to the general rule occurs in the wide-ranging *Gnaphaloryx opacus*, Plate XV, figs. 11–13, of which the female has the front tibiæ more slender than the male and strongly curved—no doubt an adaptation to some unusual mode of life. (A rather similar form is found in another peculiar and apparently rare little Indian species, *Dorcus curvipes*). The middle and hind tibiæ of the female may have stout lateral spines which are absent or feeble in the male, those of the male may have hairy pads, as in *Calcodes marginatus*, or notches, as in *Dorcus biplagiatus*, which are absent in the female. In some species of *Calcodes* the prosternum is produced in the male.

There are many other differences between the sexes, of a very varied kind and affecting almost every part of the body. It is rather remarkable that the abdomen, which in other Lamellicorns is especially apt to show such differences, is here almost the only exception. In *Dorcus macclellandi* there is a tufted process at the extremity of the abdomen of the male, but I know of no similar case. In some species of *Lucanus* the male has a remarkably long clypeal process or clypeo-labrum and in various forms of *Dorcus* the corresponding part, instead of being lengthened, is very much widened in that sex. It might reasonably have been supposed that the presence or absence of so well-developed a structure as the forked process, very conspicuous in the male *Lucanus lunifer*, would afford an important means of grouping the species but, like so many other features, the clypeus of the male is liable to an extreme variability. Its development closely follows that of the mandibles and it may be narrow or broad, according to the distance separating these at their bases in different individuals. In *Dorcus titanus* it may be deeply divided or entire ; in the Malayan *Calcodes sommeri, lowei* and

brookeanus, in which the mandibles have two different phases, in one meeting closely and in the other widely separated, a very conspicuous clypeal process appears between them in the latter phase but is quite absent in the other.

The astonishing difference commonly found in the mandibles of the two sexes needs no emphasis but the other organs of the mouth usually differ also. The maxillæ in many species have a hooked termination to the lower lobe in the female but not in the male, the palpi are often elongated in the latter and the mentum may differ in shape and sculpture or have a clothing of hair in the male, which is absent in the female. The hook-like backward extension of the mentum in the male *Figulus caviceps* is remarkable, since it occurs in a genus of which the other species have identical males and females.

The head of the female is commonly shorter, as well as more roughly sculptured, than that of the male, which is usually rather smooth, and, apart from the head, the sculpture of the upper surface is rarely the same in both sexes. The female may be glossy and the male dull, as in *Calcodes æratus* and *Dorcus wimberleyi*, or conversely the female may be less smooth than the male, as in the genus *Cyclommatus*. In *Dorcus reichei*, *curvidens* and *hyperion*, the elytra, smooth in the male, are very deeply grooved in the female. The antennæ of the male are generally longer than those of the female, but the much greater development of the sensory part of these organs, so conspicuous in many Lamellicorns and other insects, is rarely found in the LUCANIDÆ.

In one rather primitive genus, *Sinodendron*, already mentioned, which is found in Europe and also in North America, there is no enlargement of the mandibles of the male but instead there is a horn upon the head like that of a rhinoceros in the male but rudimentary in the female. In certain Indian species the female (e. g. in *Dorcus nepalensis*) has a rudimentary horn in the same position, of which there is no trace in the male. Other females (*D. reichei*, etc.) have two little elevations at that point and in *Dorcus derelictus* these become rather sharp processes placed at the hinder edge of a slight depression. They are unrepresented in the males but, strangely enough, the males of certain other species of the genus, *Dorcus foveatus*, etc., have a pair of exactly similar sharp processes, also occupying the hinder edge of a depression and not represented in the females. We must conclude that ancestral forms have existed in which both sexes had such processes upon the head. It has been suggested by Lameere that the LUCANIDÆ are derived from ancestors with horns but without exaggerated mandibles and that, by a compensatory process, a gradual enlargement of the mandibles accompanied the simultaneous disappearance of the horns. Darwin,

in 'The Descent of Man,' had previously expressed his belief in such a compensatory process as explaining the disappearance of horns in the Coprid genus *Onitis* and other evidences of its existences are not rare, but Lameere's theory cannot be regarded as more than a bold speculation.

Male and female LUCANIDÆ may be absurdly disproportioned in size, the male a giant, the female a dwarf, the reverse of the usual condition in insects. Finally, colour and pattern may be dissimilar. The male *Lucanus mearesi* is metallic green or bronzy, that of *Hexarthrius parryi* has bright yellow elytra with a black border; the females of both are black. In *Dorcus wimberleyi* the male is brick-red in colour and the female is decorated with bright yellow stripes on a black background. *Dorcus histrio* is yellow with a dark head and dark stripes on thorax and elytra, its female is black with yellow-bordered elytra. In others, *Dorcus speciosus*, *Calcodes cuvera*, *delesserti*, etc., in which the elytra are in part black and in part yellow, the proportions of the two colours are different in the two sexes.

It is evident that the correct association of the two sexes of these insects may be difficult; but the association of male specimens of different sizes of the same species may present similar difficulty, for, while female LUCANIDÆ are rather constant, males are astonishingly polymorphic. If a long series of examples is assembled of any species differing strongly in the sexes, it will be found that those features which distinguish the males are exceedingly variable, being most pronounced in the largest and least in the smallest, with a gradual transition through those of intermediate size. If, therefore, the two sexes differ completely, it may be found that large and small males of the same species have scarcely any external character common to both. When, as has very frequently been the case, systematists have dealt with single specimens only, they have quite naturally regarded and named the different phases as different species. In *Dorcus reichei*, Plate II, fig. 1, the females (fig. 1 *a*) have the head rough and the elytra deeply grooved and bear no resemblance whatever to the extremely smooth males, fig. 1 *b*, well-developed examples of which are twice the length of even the largest females, and have an enormous head with branched mandibles as long as the head and thorax together. Smaller examples are less smooth, the head is smaller, the jaws shorter, and the elytra show traces of longitudinal depressions, fig. 1 *e*. The less the size the greater becomes the resemblance to the other sex, until we reach tiny male specimens, fig. 1 *b*, one-third the length of the large ones, with a small rough head, insignificant mandibles and deeply grooved elytra; there is a close resemblance to the female and none at all to the large males. An

exactly similar transition can be studied in *D. tityus*, *D. curvidens* and other abundant forms. When the two sexes show a different coloration small males may assume the female pattern. For instance, the male *Dorcus occipitalis* is pale yellow and dull, with a very small black spot in the middle of the thorax; its female is shining and has a large black spot and a black sutural stripe. Small males may not only be without the structural features distinctive of their sex but may also acquire the glossy surface, the large black spot and black stripe of the other sex.

This gradual transition from one phase to another, according to the size of the specimens, is the simplest form of male polymorphism occurring in the LUCANIDÆ. The occurrence of two or more phases in fully-developed examples of the same species is less well known. The head and mandibles of the males of a species may develop differently in different parts of the area of distribution of that species, females and small males being alike throughout the area, while large males present a different aspect in different regions. For instance, in *Dorcus foveatus*, Plate XV, figs. 2–7—common in the Himalayas and Assam—small males (figs. 3, 4) have the mandibles finely toothed along the inner edge. In larger specimens, fig. 5, the edges are smooth in the middle and the teeth are restricted to the base and extremity. In still larger examples some of the basal teeth disappear but two of them persist and become larger, fig. 7. In Assam full-sized males, fig. 6, have only a single large tooth remaining upon the basal half of the mandible, but in the Darjeeling district corresponding examples, fig. 7, have two teeth in this part. This phase was supposed to constitute a distinct species and given the name *poultoni*. A similar bifurcation occurs in *D. tityus*, another Indian species of which the large males have two forms differing in the toothing of the mandibles; the later-described phase was given the name *tethys*, in the belief that it was specifically distinct. The most striking example of this kind, is that of *Dorcus giraffa* (Plate XIV, figs. 1, 2). The smallest males of this very widely distributed species have narrow, gently curved mandibles of quite simple form. At a more advanced stage the jaws are exceedingly long and there are numerous small sharp teeth scattered along the inner edge. The most highly developed males are of two different types. In certain localities one of the teeth, situated at about two-thirds of the length of the mandible, is much enlarged and the jaw, which is almost straight to that point, is very strongly curved beyond it. This is the form (Plate XIV, fig. 1) which occurs in Assam, Burma and the Malay Peninsula. But in the Darjeeling district and the United Provinces of India, as well as in Tongking and part of China, such specimens are

not found. Large males (Plate XIV, fig. 2) occurring there have mandibles the curvature of which is uninterrupted from base to tip and the teeth also form an uninterrupted series, of which the largest is always the first, placed before the middle instead of beyond it. Supposing these specimens to indicate a distinct species, and unfortunately associating with them a female of a very different species, Dr. Gravely gave them the name of *arrowi* ; but a careful comparison of females and small males from all districts has compelled me to reject his view and to regard this also as a case of one species with two male phases.

A very abundant Stag-beetle, with a wide range in the East, is *Dorcus titanus* (Plate VII, figs. 1–4), a large black insect, the males of which have the mandibles long and broad, except at their curved tips, with the widest part toothed like the edge of a saw. Again the large males exhibit two phases, those from India and the Malayan region having very broad mandibles (fig. 1), of which the toothed part occupies the middle, while in China and Japan they are narrower and relatively longer (fig. 3), with the toothed part of greater extent. These two forms have been regarded as distinct species, and the second named *Dorcus platymelus*, but, since the females (fig. 4) and small males (fig. 3) are alike everywhere, I regard them as local forms of a single species.

The fact that this bifurcation is found in some of the commonest species, of which large numbers of specimens can be brought together, seems rather significant. It leads to the question whether other forms, at present known only from a few specimens of each, may not be found to be similarly connected when long series are available for comparison. Many LUCANIDÆ are known only from single examples or from specimens of only one sex. Even in common species the phase of greatest development may be of relatively infrequent occurrence, the majority of specimens being of medium size. It seems probable that the reason why certain remarkable forms remain known by unique specimens only for long periods is that they occur only at long intervals or under exceptional conditions and perhaps for years together are actually nonexistent.

A single specimen of a species of *Onthophagus* now in the Calcutta Museum (*O. lemniscatus*) has a pair of extremely long horns, like twisted wire, upon the head, extending backwards for a considerable distance and then bending abruptly and reaching forward beyond the point of origin. The specimen was taken in the Botanical Garden at Coonoor, in Southern India. At my request, Mr. S. H. Butcher, a botanist on the staff, made a prolonged search for further specimens. He sent me numerous examples but every male

had short straight horns without any resemblance to those of the type specimen. Although twenty-five years have passed, I believe no other specimen like this original example has been seen. It is easy to form in imagination a series of transitional forms linking the short-horned with the fantastically-horned phase, but there is no evidence of the actual existence of such intermediates. In a paper published in Trans. Ent. Soc., 1928, I mentioned a South American Dynastid beetle, *Enema pan*, the male of which has two different phases, formerly regarded as specifically distinct. In the ordinary form, found in all stages of development, the head bears a slender pointed horn, directed backward, and the thorax a strongly forked horn directed forward. In the second male phase, the thoracic horn is undivided and slender, while that on the head is divided at the tip. This phase, which occurs together with the other, is never found in different stages, but is confined to specimens of full size. Smaller males always belong to the normal phase and females are all of one form. This remarkable type of dimorphism in the male, which seems to be rare elsewhere, is especially prevalent in the LUCANIDÆ, the mandibles of which exhibit in certain cases the same phenomenon as the horns of *Enema pan*.

If males of any abundant Stag-beetle are arranged in the order of their size, the mandibles will be found to show a corresponding but more rapid increase of size, accompanied by a regular advance from a simple to a less simple pattern. In small specimens the inner edges are often capable of meeting from base to tip, but in larger ones they become gradually more separated and in the largest meet only at the tips. The term Priodont was applied by Leuthner to the first stage in this development and the last stage he called Telodont. It is a well recognized principle that the degree of development of the Lucanid mandibles, like that of the horns of other beetles, bears a fixed, although not a simple, mathematical relationship to the size of the specimen bearing them, their increase being much greater than that of the body. The occurrence in certain cases of an isolated male phase, more highly developed than and unconnected by intermediates with the ordinary form, appears to form an interesting exception to the general rule.

The Indian *Dorcus suturalis* (Plate II, fig. 4) is a good example of this curious phenomenon. Ranging the males of this species according to size, we find that their mandibles show a gradual advance from the short and broad Priodont condition of the smallest specimens, fig. 4 *a*, to a slender form, in which they meet only at the tips, in those of full size, fig. 4 *f*. But, together with males showing this regular progression, others are found in the same places which, although their size is

no greater, have longer mandibles of quite a different pattern, fig. 4 *g–i*. Such specimens form quite a distinct phase, unconnected by any intermediates with the progressive series. They are always of full size and, unlike the rest, show practically no variation.

A very striking example of a Lucanid with these two distinct phases is *Calcodes æratus*, (Plate XX, figs. 8–11), which is found in numbers in the Malay Peninsula. It is rather a small insect, males varying from 13 to 27 mm. in length, exclusive of the mandibles. It is unique in its genus for its beautiful metallic colouring and also for the fact that, from the smallest to the largest-sized specimens, the mandibles show extremely little progressive development. In a very small male (fig. 8) they are very tiny, less than half as long as the head, but as we pass to larger and larger specimens we find only very slight development, and a specimen of the largest size known may have them only a little more than half the length of the head. But other male specimens occur with very highly-developed jaws which, as the figure (fig. 10) shows, bear no resemblance at all to those of the ordinary phase. Together they form almost a perfect circle and are toothed internally in a very curious and elegant manner. Again, only large males of this phase are found and no sort of transition appears to exist.

The genus *Calcodes* contains many cases of the occurrence, side by side, of the two phases, one inconstant and the other constant, the specimens of the latter being usually less numerous than those of the former. The common Indian *Calcodes siva*, shown in Plate II, fig. 2, is a good example. The males have usually short, stout jaws, finely toothed at the inner edge (figs. 2, *a*, *b*, *c*), but some have them long and slender (fig. 2 *d*), and between the two forms no links are found. The British Museum collection contains thirty-three short-jawed males, ranging from the smallest to the largest size, as well as eleven long-jawed ones, all of large size. The same genus is represented in Ceylon by *Calcodes carinatus* (Plate II, fig. 3), which is not uncommon there, and I have seen about fifty males of all sizes of the variable phase, figs. 3 *a–c*, of which the mandibles show a gradual progress from the short, broad Priodont form of the smallest to a narrow, slender form, with a lobe at the base and a pointed branch before the middle. Together with the fifty examples of this variable phase were taken thirteen specimens of an isolated phase, fig. 3 *d*. In these the mandibles are much longer, the basal lobe and the pointed branch are both absent and, instead of them, there is a forked branch beyond the middle which is not found in any specimen of the variable phase. In *Calcodes cuvera*, *delesserti* and other species of this genus two exactly similar phases are found, the numbers of each bearing a similar proportion to

those of *C. carinatus.* In other cases the isolated phase seems to be very rare. The corresponding phase of the Philippine *C. alces* is represented in the British Museum only by a single specimen captured nearly a hundred years ago, and I am not aware that a second has ever reached Britain. The Indian *Dorcus spencei* (Plate IX, figs. 5 and 6) is another species of which, during very many years, this phase has only once been found. Another Indian insect, closely related to *D. spencei*, is of rather particular interest. This is *D. polymorphus*, which is abundant in the Darjeeling district, from which I have seen about 80 males, all but three of them belonging to the variable phase (Plate II, fig. 7). Small specimens have flat triangular mandibles, the inner edges of which are straight and can be brought together from base to apex. In larger specimens they are separated near the base but in the anterior half remain capable of close contact. In two of the 80 specimens the mandibles have an entirely different form, fig. 5. They are slender, curved and far apart, so that only the tips can be brought together, and their inner edges bear only a few scattered teeth, instead of the close rank found in the other phase. There is also an erect tooth upon the upper surface, of which no trace appears in the ordinary form. The remaining specimen (fig. 6), in the Oberthur collection, is a remarkable one. Like the two just mentioned, it is of the maximum size. The left mandible is in every respect that of the rare isolated phase, while that on the right is identical with that of a similar-sized example of the ordinary phase.

I have seen only one other Lucanid which, like the last, combines in itself both the constant and inconstant phases. This is a male in the British Museum of *Dorcus forceps*, an insect inhabiting Borneo and Sumatra. In this case the right, instead of the left, mandible is that of the isolated phase and the left is that of the variable phase. I have learned from the late M. Oberthür that in his collection is a male *Dorcus suturalis* in which is combined the two forms of mandible I have described above.

Dimorphism of this peculiar kind is confined to no particular region. In Madagascar *Dorcus serricornis*, a species related to *D. polymorphus* and *D. forceps*, has two similar male phases, but of twenty-six male specimens only one represents the isolated phase.

Although the predominance of the inconstant form is the general rule it is not invariable. The West African *Dorcus faber* is an interesting exception. I have seen 16 male examples of this, 13 of which have long, slender, strongly curved mandibles, meeting only at their tips, while only three have the

short triangular mandibles which indicate the usually predominant variable phase. In this case the length of the jaws and of the insects themselves is less constant than usual in the isolated phase. It seems probable that this phase is replacing the other as the normal form of the species, and that the more primitive form is in course of disappearance. In many LUCANIDÆ, as in those belonging to the genus *Lucanus*, the primitive type of the male mandibles, meeting at the inner edge, is not found, and it may be that it has been replaced by the later-evolved phase which, originally constant, has now become variable, like the form it has replaced.

No similar dimorphism is found amongst female beetles. In those Lamellicorns remarkable for the horns borne upon the head or thorax, these, although generally distinctive of the males, are in some cases well developed in females also, but the occurrence of two phases, as in the mandibles of LUCANIDÆ, is confined to male horns. A single instance has been noted amongst these beetles of the combination of the two phases in the horns of one individual. This is in a South American beetle, *Megaceras jason* *, the males of which have a slender horn upon the head and a very massive one upon the thorax. Thirty-eight male specimens of this collected in Ecuador were found to show two horn-phases, 18 of all sizes belonging to the variable phase and 16 large specimens to an isolated phase, while one example shows the two phases on opposite sides of the body.

It is probable that this strange form of polymorphism is less uncommon than appears at present. At least, it is not peculiar to the Lamellicorn beetles. In the magnificent Longicorn beetles of tropical America, belonging to the genus *Psalidognathus*, the females of which are without wings, and in the related genus *Prionocalus*, of which both sexes are wingless, enlargement of the male mandibles occurs exactly as in the Stag-beetles, and a similar transition can be traced from small to large individuals. The females of these insects have broad mandibles with sharp cutting edges, which meet and cross one another like scissor-blades, the front half of the inner edge straight, the hinder half a little jagged. The great males, which may be three inches in length, have long, curved calliper-like mandibles, which meet only at their tips. But in males of very small size the mandibles are precisely like those of the females and the calliper shape only appears gradually as we examine larger and larger specimens. Exactly similar conditions are found in a South African Long-horn, *Cacosceles newmani*, the female of which has scissor-like mandibles, while in large males they are much longer and

* (See Proc. Zool. Soc., ser. A, vol. cxii, 1943, p. 113, pl. i, figs. 3–5.)

calliper-like, and a gradual transition can be followed from very small males in which the form is identical with that of the female.

A related species living in Southern India, *Priotyrannus mordax*, is of particular interest. The female has scissor-like jaws, the edges of which bear fine sharp saw-teeth. In small males the form is the same and increasing size brings little change, except that the proportionate length of the mandibles become slightly greater. In the very largest males, however, the mandibles are calliper-shaped and a series of twenty specimens of this sex in the British Museum is equally divided between the two phases, without any passage from one to the other. (Proc. R. Ent. Soc. (A), xiv. 1939, p. 113.)

We find then, amongst the Coleoptera, certain forms, like those of *Psalidognathus*, in which the transition from the female to the male type of mandible is complete; in others, such as most of the Lucanidæ, the earliest phase, in which the two sexes have identical mandibles, is wanting; in yet others, like *Lucanus*, all the early male stages are absent and the dissimilarity is very great, while in *Priotyrannus mordax*, *Calcodes æratus*, *Dorcus suturalis* and such forms, the penultimate male stages have disappeared and we have two distinct phases in that sex. Since sexual dimorphism has an evident connection with large size, those species in which all the stages still exist seem to indicate descent from a smaller ancestor, both sexes of which were alike, the different male phases recapitulating the stages in its evolution that have accompanied increase in size. The disappearance of some, but not of all, the transitional stages is as yet unexplained, and still more difficult to account for is the, no doubt rare, occurrence of two different stages in a single individual. The latter may perhaps be due to some unknown cause operating during the pupal period.

When we pass from the consideration of the Lucanidæ to study the Passalidæ, the change from an extremely polymorphic family to one of exceptional uniformity is surprising. With only two known exceptions the colour of the five hundred described species of Passalidæ is the same—black. The general form of the body is the same throughout the group, and the legs and antennæ do not vary in proportion to the size of the insect to which they belong. Moreover, instead of an extreme inconstancy of form in the individuals of the same species, we find a remarkable constancy. With certain exceptions, the different species of Passalidæ consist of individuals unusually uniform in size. Most remarkable of all, not only are the extravagant developments of the male, so frequent in the Lucanidæ, conspicuously absent in the Passalidæ, but not a single species is known in the family

of which the two sexes can be distinguished by any external difference.

This complete contrast between the two groups is no doubt to be explained by the difference in the mode of life. After reaching the adult stage those LUCANIDÆ whose life-histories are known, leave the rotting wood in which they have been living and feeding and henceforth live in the open. Although the female returns to deposit her eggs, the male, with his unwieldy jaws and long legs, is quite incapable of burrowing into even the softest material. The PASSALIDÆ, on the contrary, on reaching maturity, continue to inhabit the same places, their narrow compact bodies, short legs, and sharp stout jaws enabling them to penetrate and masticate the woody material. A few members of the group (e. g. *Ceracupes* and *Aulacocyclus*) have processes upon the mandibles and head but these have not developed so far as to hinder and may conceivably assist them in the performance of their functions. Certain LUCANIDÆ also have processes upon the mandibles which are common to both sexes instead of being confined to the males (e. g. *Nigidius*). These also have attained only a small degree of development. It is evident that the growth of the mandibular processes of the PASSALIDÆ to anything resembling the fantastic structures acquired by many Lucanids would effectively prevent them continuing their burrowing activities and, unless accompanied by a simultaneous change in their mode of life, must bring about extermination. Similarly, the continued development of such outgrowths in both sexes of LUCANIDÆ would ultimately result in hindering the females from reaching the proper situations in which to deposit their eggs. Since the males take no part in this operation, continuance of the species requires only restricted development in the female sex. In the other family male and female live side by side, and there is good reason for believing that their offspring are to a greater or less extent dependent upon both parents. The undue development of any appendages which hindered their free movements would therefore affect the next generation harmfully, whether in one parent or both.

In dealing with the COPRINÆ, I described * an investigation of the evidence afforded by the wearing down of the teeth upon the tibiæ as to the share, borne by male and female respectively, in the necessary labours of the species. This investigation led me to the conclusion that "where the two sexes have similarly developed armatures, or when that of the male is of moderate development only, both sexes are likely to show the effects of use in the forelegs in a similar degree; but where they are very dissimilar and the male

* See Arrow, Fauna of British India, Coprinæ, p. 30.

has an exaggerated armature the evidences of labour are found in the females alone."

In the LUCANIDÆ female specimens are often found in which the front tibiæ show some amount of wear, although probably few have occasion to perform such strenuous labours as are the lot of many COPRINÆ. Male Lucanids, however, although their tibial teeth are usually very sharp and spine-like, seem never to show any signs of wear, clear evidence that the females alone perform the labours necessary to ensure the existence of the progeny. Inheritance by that sex in any degree of the extravagant mandibular developments of the male would prevent the proper performance of those functions and ultimately entail the extinction of the species ; but, so long as the inheritance is confined to the male, the well-being of future generations is not affected. Unless the extravagance reaches a point at which locomotion becomes difficult, it seems to entail no particular disadvantage, as compared with other insects in which such a tendency is absent. But in the PASSALIDÆ, the mandibles of both parents being important for the well-being of the young, the manifestation of a similar tendency in one sex or both would result in endangering the perpetuation of the species. Only races in which no such tendency existed would ultimately survive. In other words, the complete contrast between the two groups in this respect seems to me to be best explained by the operation of natural selection.

As to the significance of the great mandibles of male Stag-beetles, the arguments adduced in my previous volume, in considering the horns of the COPRINÆ, apply equally to these. Those arguments led me to reject both the supposition that such appendages can be adequately explained as weapons, offensive or defensive, and that put forward by Darwin, that they may serve as ornaments attractive to the other sex. The accounts of contests, which have often been observed between the males of the European *Lucanus cervus*, do not indicate that their mandibles show any adaptation for fighting or can be accurately described as effective weapons. Some forms, like *Hexarthrius parryi* with stout sharp-pointed jaws, appear capable of inflicting more serious injuries, and scratches are sometimes found upon these, but I have found none but of a superficial kind. The progressive elongation of the jaws, characterizing most forms, entails diminished instead of increased offensive power.

Leuthner, in his 'Monograph of the Odontolabini,' (Trans. Zool. Soc. xi, 1885, p. 401, note) speaks of "numerous injuries observed in specimens of (*Calcodes*) *alces* of all sizes ; some of these consisted of deep punctures and indentations, generally in pairs, on the hard prothorax

and elytra, which were evidently produced by the middle teeth of the mesodont form " and he figures the elytra of a specimen of *C. cuvera* with six symmetrically arranged wounds ; but he has overlooked the fact that no weapon can pierce any surface except upon an opposed plane. The two mandibles of *C. cuvera* could not possibly both pierce the smooth upper surface of another specimen symmetrically and at the same time, and therefore these symmetrical marks must certainly be due to some other cause. Such marks, which I have seen in other beetles, I believe occur in the pupal state and I am inclined to attribute them to the attack of a fungus.

There seems, indeed, to be an almost complete lack of evidence for either of Darwin's suppositions, put forward in support of his theory of Sexual Selection, that larger mandibles afford advantage to their possessor in combat with other males, or that they constitute an attraction for the females. Mr. R. E. Parsons, who for several days observed many specimens of *Dorcus foveatus*, large and small and of both sexes, which had the habit of congregating upon a particular Citrus tree in Assam, found that in the cases he noticed " it was the small males that mated with the females and the large males did not seem to want to interfere with the mating of the small males and did not disturb the latter and their consorts."

It may almost be said that the possible efficiency of the male mandibles as weapons is in inverse proportion to their size, for, the muscular force being applied at the base, the pressure that can be exerted at the other end diminishes in proportion to the length. In the primitive state the jaws of the male, as well as those of the female, were no doubt efficient biting organs, but the process of elongation, although sometimes, as in the genus *Lucanus*, accompanied by an increase in the size of the head, as though in an effort to maintain muscular strength, has generally involved a progressive diminution in biting or gripping power, so that it might be said that the insects as a consequence are preserved from such injuries as are often inflicted by insects with jaws of normal size. The Chilian *Chiasognathus granti*, perhaps the most extravagantly armed of all LUCANIDÆ, the jaws reaching a length greater than that of the body, was subjected to experiment by Darwin himself, who has recorded that " the mandibles were not strong enough to pinch my finger so as to cause actual pain." As a beetle's exterior is far better protected than the human finger and the jaws of *Chiasognathus* bear numerous fine teeth needing little pressure to penetrate the finger, we cannot suppose them to be of importance as weapons.

There is still less reason to regard the male mandibles as constituting an attraction for the other sex. Apart from the

absence of any evidence of choice exercised by female insects and the very doubtful existence of the æsthetic sense required for an appreciation of the comparative attractions of their suitors, a comparison of the eyes of the LUCANIDÆ with those of other insects must soon convince us that their powers of vision are quite inadequate for any such appreciation. The compound eyes of insects consist of numerous elements, each with a separate lens and external facet, which receive the light from a small part of the field of vision, the result being a mosaic picture, the clearness of which varies according to the number of component lenses in the eye. In some well-endowed insects, such as butterflies, these may be from 12,000–20,000 in a hemisphere on each side of the head, so that the light is collected from every possible direction. The two hemispheres may occupy most of the head, as in some Dragonflies, which may have as many as 28,000 facets in each eye. Some beetles, such as the Tiger-beetles (CICINDELIDÆ), which are very agile and prey upon other insects, also have large prominent eyes with many facets, but most have rather poor sight and the Stag-beetles are amongst these. In most the eyes are very small and consist of a few hundred facets only. In *Lucanus cervus* there are about 2,000 and in most LUCANIDÆ less than that. The eyes are far apart and so placed that no comprehensive outlook is possible. In some of the great species, like those composing the genus *Calcodes*, each eye is completely divided into two halves, the larger placed beneath the head for the perception of objects lying between the fore-legs, while the other half is level with the upper surface of the head and can receive intimations only of conditions immediately above. There is even a species of LUCANIDÆ, *Vinsonella cæca,* in the island of Mauritius which, although sexually dimorphic like most of the family, is totally blind. In *Aulacostethus archeri*, Plate XXI, figs. 7 and 8, the eyes are so greatly reduced that the sight must be extremely feeble, and in others they can be of very little use. Even insects, such as butterflies, with comparatively good sight are easily deceived by artificial flowers or coloured imitations and only convinced of their error after repeated and close investigations.

The fact is that in insects many of the functions served by the eyes in higher animals are performed by the antennæ, the seat of the olfactory sense, which is much more important to them than that of sight and is developed to greater perfection. It is by that sense that insects are able to recognize other individuals of their species as well as the substances which serve them for food. The subordinate function of the eyes is shown by the complicated operations often performed in complete darkness by insects such as ants and bees, the construction of the comb and feeding and tending of the

young, as well as the delicate tasks involved in the nidification of numerous burrowing beetles like the Lucanid *Sinodendron* and the Coprinæ described in a previous volume of this series.

The most significant fact concerning the mandibles of male Lucanidæ is the relation between their size and that of the insect bearing them. The size of the insect determines the degree of development of its mandibles. Large mandibles are found in large-bodied species and specimens, and small mandibles in small species and specimens. The ancestors of all the Lucanidæ, there is reason to believe, were small insects with mandibles of normal size, differing little or not at all in the two sexes, and the great development of the organs in the male has occurred as a concomitant of the great increase that has taken place in the size of the insects. The key to the phenomenon must therefore be sought in the causes that, in the course of ages, produce changes in the size of animals of whatever kind. Had Darwin been aware of the important size-relation I have mentioned, he would not have written "It seems probable that all these characters (he included the mandibles of male Lucanidæ) have been gained through the same means, namely Sexual selection." It appears to me that Natural Selection, and not any sexual selection, is the method by which existing sexual differences have been brought about. In the genus *Nigidius*, in which both sexes have mandibles of a kind usually peculiar to males only, we must suppose that these organs, owing to the special conditions of their life, present no hindrance to the females in the task of oviposition; whereas in other Lucanidæ mandibles such as are borne by the male would undoubtedly be an encumbrance to the female. The feature, however acquired, has been transmitted to both sexes in the first case; in the second, any tendency to its transmission to the female, causing a definite hindrance to the perpetuation of the species, has been checked by that means, and the result has been a natural selection of races with a weaker tendency to such inheritance by the female. In the horn-bearing genus *Sinodendron*, where the mandibles of male and female are alike and both sexes share the tunnelling operations, we may suppose that the enlargement of the male mandibles which has taken place in other genera has, by the operation of Natural Selection, been suppressed through the hindrance which would result in the performance of those operations. Conversely we may conclude that the fact that in other genera the males take no part in providing for the well-being of their offspring and, their mandibles being unused, the restraining influence of Natural Selection is in consequence not brought to bear upon them, is a part cause of the generally prevailing hypertrophy of the organs in male Lucanids. If, in any particular case, a useful employment had been acquired

for the mandibles, a better adaptation for such use would in time result from the operation of the selective process, as has happened to some horn-forms in Coprine beetles, but evidence of such adaptation is not easily to be found in LUCANIDÆ. It may be noted that the alternation of the teeth upon the opposed mandibles to be observed in females, which increases their gripping power, usually persists in those of males not in a very advanced condition, but is often replaced in the most highly developed condition by complete symmetry, the gripping power being sacrificed because unrequired.

It is natural to seek for some practical explanation for these highly-developed and therefore apparently important organs, and many have been suggested. Major Hingston, in 'The meaning of Animal Colour and Adornment,' has put forward the view that their use is protection by the intimidation of their enemies. "Some male stag-beetles have enormous jaws, extravagant far beyond physical needs . . . they possess the same attributes that characterise the antlers of stags . . . they are now mainly intimidating instruments" (p. 267). The rapid multiplication which is liable to occur in insects accidentally introduced into a fresh habitat shows that the effective enemies are not those which can be described as casual but those which have a well-established habit of preying upon them, and a fallacious appearance unrelated to any real threat would have little effect upon these. In addition, there are grounds for believing that the males of many of these beetles much outnumber the females and, since the latter, which need it more, are without such protection, the effect upon the future generation would in any case not be important.

Although it appears strange that organs of no real importance should, notwithstanding, attain the size and fantastic appearance seen in some of these beetles, it must be remembered, first, that a greater increase in these organs is found to be an invariable accompaniment of the increase in body-size which has happened to these large insects ; and, secondly, that, being confined to the males, it has no effect upon the perpetuation of the species and is, in consequence, uncontrolled by Natural Selection.

CLASSIFICATION.

Those members of our two groups which were known to Linnæus were included by him in his great genus *Scarabæus*. From this the genus *Lucanus* was separated in 1763 by Scopoli and the genus *Passalus* in 1792 by Fabricius. In 1819 Macleay devised a single group, which he called *Recticera thalerophaga*, to comprise the two families LUCANIDÆ and PASSALIDÆ, to which he added for certain aberrant forms now included in the former, three more families (ÆSALIDÆ, SYNDESIDÆ and LAMPRIMIDÆ) in accordance with his conception of the "quinary" system of Nature. The quinary

system was afterwards applied by Dr. Kaup of Darmstadt to the PASSALIDÆ with such excessive confidence that he ventured to foretell the precise number of species of that family ultimately to be found in the world, namely 325. Although this number has already been considerably exceeded, new forms still persist in revealing themselves.

Macleay's five families were adopted in the 'Catalogue of the Lucanoid Coleoptera in the collection of the Rev. F. W. Hope,' published in 1845. The names occurring for the first time in this work have been attributed to Hope, no author's name being printed on the title-page; but it is recorded by G. Albers (Deutsche Ent. Zeitschr., vol. xxviii, 1884, p. 301) that a copy of the work was sent by Westwood to Snellen van Vollenhoven in which he had added to the title the words "by J. O. Westwood." As it is probable that Hope had some share in the work, I have treated it as a joint production.

In Lacordaire's 'Genera des Coléoptères,' vol. iii, (1856), the families were reduced to the two now generally recognized, and the term Pectinicornes was applied to them in contradistinction to the Lamellicornes. Gemminger and Harold's 'Catalogue of the Coleoptera' (vol. iii, 1868) united them into a single family LUCANIDÆ, subdivided into LUCANINI and PASSALINI.

The reasons for regarding these two groups as forming a suborder apart from the Lamellicornia, were argued at some length by Lacordaire. Essentially they are three in number—the want of mobility of the club-joints of the antennæ, the separation of the ventral ganglia of the central nervous system and differences in the larvæ. The Passalid larva certainly differs very greatly from all known Lamellicorn larvæ, but it differs in exactly the same way from the Lucanid larva, which is of the ordinary Lamellicorn type, the most important difference being in the longitudinal anal aperture, which is not shared by the PASSALIDÆ. There is therefore no better reason for attaching PASSALIDÆ to LUCANIDÆ than to the Lamellicornia generally on account of their larvæ. In the nervous system, Lacordaire admits that the PASSALIDÆ form a link between the LUCANIDÆ and SCARABÆIDÆ; but since we are completely ignorant of the internal anatomy of nearly all the very various groups of that enormous assemblage of forms, it is unsafe to draw any conclusions from it. The antennæ, therefore, alone remain to justify the suborder Pectinicornia. A careful scrutiny of Lacordaire's definition of this group reveals that, while his characters apply to the LUCANIDÆ, scarcely a single one is applicable to the PASSALIDÆ, not excepting that of the antennæ, which indeed are so completely different in the two families that, if they are of decisive importance, not one but two suborders must be recognized.

Examination of the various organs of the mouth shows as little agreement as can be found in the shape of the antennæ or of the larvæ. It is no doubt true, as maintained by Lacordaire, that in general the two groups agree in having less freely movable lamellæ in the antennal club than other Lamellicornia. In certain LUCANIDÆ (e. g. *Figulus*) the club appears to be almost completely rigid, but there is very great variation amongst the genera in this respect, and, in view of the immense variety of structure occurring in the antennæ of the Lamellicornia, that group is quite comprehensive enough to include the two families LUCANIDÆ and PASSALIDÆ.

The later history of the PASSALIDÆ has been a peculiarly unhappy one. The quinary system into which they were remorselessly regimented by Kaup ('Monograph of the Passalidæ,' Berl. Ent. Zeit., 1871, suppl.) demanded that no genus should contain more than five species and that every five genera should constitute a distinct group. The 171 species known to him required no less than 58 genera for their accommodation, leaving exactly 7 genera and 154 species still undiscovered, to which he wisely refrained from giving names.

The creation of generic and specific names on wholly inadequate grounds is often the direct cause of the creation of yet more superfluous names by other workers for other specimens that fail to conform to the flimsy definitions. Kaup's successor, Kuwert, attempting to build a better structure without relaying the foundations, instead of drastically reducing the number of genera actually added 60 more. His monograph of the family, 'Die Passaliden dichotomisch bearbeitet' (Nov. Zool., 1896–98), is lamentably uncritical and full of errors. Later students of the group, F. H. Gravely ('A Contribution towards the classification of the Passalidæ of the World,' Mem. Ind. Mus., vii, 1918, p. 1) and Messrs. Hincks and Dibb, who have compiled a catalogue of the family (Coleopt. Cat., Passalidæ 1935), although they have raised the total of the species to almost 500, have reduced the genera to much less than half, and still further reduction seems to be needed.

This process of reduction in the number of genera is in truth a natural one in any large group as the number of known forms increases. In early days of systematic science, when comparatively few forms were known, the gaps separating them were many, and genera and larger divisions were therefore easily defined. With the gradually increasing number of known forms, these gaps become more and more filled and many of them disappear entirely. Divisions which seemed natural cease to be so and genera must either be united or have their limits arbitrarily fixed. If a formula can be found for defining intelligibly an arbitrary boundary, this may be

the most convenient plan; but when relationships are so close and involved that no break at all can be made, it seems preferable to recognize the fact that the generic limits formerly apparent have ceased to be so and to abandon the use of names no longer serviceable. Many authors adopt the opposite method and attempt to solve the difficulty by multiplication of genera, depending upon ever finer differences; but still intermediate forms will manifest themselves and when, as sometimes happens, each species has a genus to itself (or a subgenus) the process becomes a *reductio ad absurdum*.

For the LUCANIDÆ no such revision as that undertaken by Gravely for the PASSALIDÆ has been attempted, and to make a practical classification of the Indian forms I have found it necessary to reduce the number of genera still more drastically than has been done for the other family. The astonishing polymorphism prevailing in the group introduces difficulties completely absent in the other case. Concerning the LUCANIDÆ, Lacordaire remarked in his 'Genera des Coléoptères,' "as to the species, many have been founded on imperfectly developed males or on isolated females of which the males are unknown, to say nothing of different names given to the same species in the ordinary condition. Thus the confusion which exists in the literature is perhaps unequalled in the rest of the Coleoptera. Each publication which appears on these insects seems to increase instead of diminishing it." The confusion became much greater after this was written. At that date (1856) the very competent entomologist, Westwood, had produced (in the 'Catalogue of Lucanoid Coleoptera') an analytical table which included the majority of the known species. Evidently recognizing the peculiar difficulties, Westwood admitted very few genera, including most of the species in the genus *Lucanus*. For the various sections of the genus, however, he accepted as subgeneric, various names which had been devised by Hope. The invariable fate of subgeneric names, which, amongst other reasons, renders them undesirable, befell these. Later authors, ignoring the fact that they were not intended as generic names, because based on characters of one sex only, used them as generic names and, where they would not fit, formed new genera similarly based on the characters of one sex. Henceforth, female specimens, the males of which were unknown, could not be referred to any genus at all or, if it should be considered desirable to name them, a genus had to be selected at random. Worse still, since the features peculiar to male LUCANIDÆ are almost without exception of extreme variability and liable in specimens of small size practically to disappear, not only females but small males were destitute of distinctive generic characters. It is unnecessary to dwell upon the inconvenience of a system

of classification which is applicable only to one sex and only to large specimens of that sex. In a preliminary note dealing with the genera of LUCANIDÆ published in 1935 (' A contribution to the classification of the Coleopterous family LUCANIDÆ,' (Trans. R. Ent. Soc., vol. lxxxiii), I therefore proposed the abandonment of all those genera based upon features found in one sex only. The result of applying this not unreasonable principle to the Indian fauna has been the reduction of the number of genera containing the 133 Indian species from 30 to 15.

It can be admitted that there are certain groups of animals in which it is necessary to base genera, and even superior divisions, upon the characters of one sex only (*e. g.* when the other sex has degenerated to a condition in which many of the important organs have disappeared). Female LUCANIDÆ show no degeneration, all their organs are extremely well-developed and the species are well differentiated. Within the limits of the family, important group characters are found in both sexes and the close similarity between many of the females undoubtedly indicates a close relationship which it is not permissible to overlook.

It cannot be argued that the amalgamation of various so-called genera, the females of which are destitute of any important structural differences, is undesirable on account of the large number of component species in the resulting genera, for the entire family contains fewer species than such a genus as *Onthophagus*, an attempt to subdivide which by means of its male characters would result in hopeless confusion. The known species of that genus undoubtedly form a much smaller proportion of those actually existing than the known LUCANIDÆ bear to the probable total membership of the group.

It may perhaps be thought that, unless both sexes are present, it may be difficult to judge whether a particular feature is peculiar to one sex or not but, since in general the characteristics of the male consist in an exaggerated proportional development of certain parts of the body and since the degree of development will generally be found to be inconstant whenever more than one specimen is present, this difficulty is actually not a very serious one. Greater difficulty may be experienced when it is desired to correctly associate the two sexes of a species. So great are often the differences that it may be almost impossible to find any identical features common to both. The repeated occurrence of the two sexes in the same localities may have to be awaited before their specific identity can be assumed. In the absence of characters in common, I have found it necessary to draw up keys for each sex separately, except in the case of genera with little or no dimorphism.

LUCANIDÆ.

INTRODUCTION.

The LUCANIDÆ are a fairly well-defined family of Lamellicorn beetles, many of the large forms of which have been long known as Stag-beetles on account of the enormous enlargement of the mandibles which occurs in the males. Although they are always well developed and exposed to view, it is only in full-sized examples of their species that the very long and fantastic mandibles are found. In some of the small forms male and female are alike, but dissimilarity between the sexes is a characteristic of the group as a whole.

Although in certain parts of the world, such as South Africa and the Hawaian Islands, there are found LUCANIDÆ which are without the power of flight and which perhaps pass most of their lives below the surface of the ground, those dealt with in this volume all appear to be active insects, possessing the normal organs and functions. Unlike representatives of the family found in Australia, they are not remarkable for conspicuous beauty of colouring, being in general dark coloured, with a certain number of red or yellow species, but they include also a few highly decorated insects, especially in the genus *Calcodes*. In the number of kinds to be found there is perhaps no part of the world more productive than the Indian region, from which 133 are here recognized as distinct species out of a total for the whole world of about one thousand.

Some of the species have an extremely glossy surface, although this rarely extends to the head. Others have a kind of bloom, like that of a ripe plum, upon the upper surface, but this is of a rather fugitive character and may be absent in old and worn specimens. Yet other forms (*Dorcus cinereus*, *Gnaphaloryx opacus*) are generally found with a kind of grey earthy incrustation upon the upper surface, either secreted by the insect or caused to adhere by some kind of sticky secretion. A few species have a covering of fine hair. All these characteristics generally vary according to sex and are rarely alike in both sexes.

Like that of most Lamellicorn beetles, the body-form shows a fundamentally fossorial (*i. e.* digging) type. This has been partly retained in most of the females but is generally lost in the males. In the former the body is commonly more compact and muscular, the head deeply sunk in the thorax, the mandibles short and strong, the antennæ and legs short, the front tibiæ flat and furnished with strong teeth at the outer edge. In the males these characteristics are often conspicuously lacking, the whole body is more loosely

articulated, the head protruding, the legs, antennæ and mandibles elongated and the teeth or spines with which the legs are furnished comparatively feeble. The exact number and conformation of the lateral teeth of the front tibia are inconstant and often differ on the two sides of the same individual, but the shape of the extremity is of more consequence and is practically constant. Usually it forms a fork with curved prongs for clinging to upright surfaces, but other forms may be found. The four posterior tibiæ may be without any lateral teeth, as in the genus *Calcodes*; there may be a single sharp spine near the middle, as in most species of *Dorcus*, or several such spines, as in *Lucanus*, in which case the actual number is again not constant even in the same individual. The tarsi, except in the remarkable genus *Penichrolucanus*, in which all the joints are completely consolidated into a single short piece, consist of five loosely articulated joints, are never very short and sometimes very long and slender. They may have thick hairy pads beneath, but usually the soles are composed of minute and inconspicuous setæ. The claws, except in the same abnormal genus, are of quite simple form, generally rather long, and between them is usually seen a well-developed pulvillus, a rod-like object surmounted by a pair of long bristles, perhaps sensory in their function. In the FIGULINÆ the pulvillus is not visible, the claw-joint being extended so as to sheathe the base of the claws, concealing the pulvillus, which is without the terminal bristles.

In the peculiar genus *Ceruchus* the legs of each pair are in contact in the middle line of the body and the coxæ are very prominent, but in all other genera of our region the coxæ are deeply embedded, and those of the first pair are separated by the prosternum, which extends a short distance behind them and is usually elevated and conspicuous behind, sometimes forming a pointed process. The front femur has upon its anterior face, close to the base, a round or oval patch of close silky yellow hairs, the function of which is unknown. An exactly similar patch is found in the GEOTRUPINÆ and other Lamellicorn groups. The antennæ are composed of ten joints, the first forming a long scape and the second attached, not to the extreme end of this but a little to the side, so that an elbowed articulation results. When at rest the organ is folded at this point and lies in a slight depression upon the lower surface of the head. The number of joints forming the club varies. It is usually 3 but may be 4, 5 or 6. These club-joints are usually not, as in most Lamellicorns, thin plates of extreme mobility with their sensory surfaces opposed and capable of being brought close together or separated. Some of the most highly developed forms, in which a multiplication of the

number of club-joints has occurred, as in the genera *Lucanus* and *Hexarthrius*, approach this type of structure, but more typical forms show only short finger-like productions of the last three joints, providing a comparatively small extent of sensory surface and capable of very little movement.

In the FIGULINÆ the three joints are extremely short, almost, if not quite, immovable and quite hard and smooth externally, the sensory surface being confined to their extremities alone.

The eyes, which are placed immediately behind the antennæ, are very finely faceted, not very large and with the part visible from above smaller than that on the lower surface of the head. Each eye is almost always more or less divided into upper and lower portions by a projection of the head in front (called the canthus), which is often more prominent in the female than in the male, so that, together with the mandibles, a triangular-shaped head may be produced in the former sex. The division of the eye may be scarcely apparent, as in the genus *Cyclommatus*; it may be nearly complete, as in *Dorcus cylindricus* and *rugosus*; or, as in the genera *Calcodes* and *Ægus*, the canthus may actually meet and unite with the hinder part of the head, thus completely bisecting the eye.

In females the head is generally short, so that the eyes are not far from the front margin of the pronotum. This is also the case with the males of some species but in many others the head is lengthened behind and a considerable interval separates eyes and thorax in this sex. This neck portion of the head is sometimes narrowed and sometimes a little swollen on each side. Sometimes a rather strong projection occurs on each side behind the eye, as in many species of *Calcodes*, in *Dorcus wimberleyi* and *oweni*, in *Ægus acuminatus*, *Gnaphaloryx opacus* and in particular species of other genera. This peculiar feature, the significance of which is unknown, is usually confined to the male but in *Dorcus oweni* it is found in both sexes.

The mouth, although not always, generally shows very considerable differences in the two sexes. The mandibles are always extruded and those of the female are strong biting organs, sharp at the tips, with interlocking projections of the inner edges, which are not the same on the two sides. Between the bases of the two mandibles is a clypeal process, which in this sex is small and generally more or less semicircular. The mandibles of the male rarely if ever show the same fitness for biting as those of the female and are generally quite incapable of any such use, the pressure that can be exerted at the tips being, of course, in inverse proportion to their length. There may be interlocking teeth near the base or studding the inner edge and then, as in the female, these will not be symmetrically placed; but this condition is scarcely ever found except in dwarfed males, in which it probably represents the persistence

of an ancient phase. In well-developed specimens the mandibles are more widely separated, the teeth fail to meet or interlock, become suppressed or changed in their character. In full-sized males the jaws are nearly always symmetrical.

The form of the clypeal process, which lies between the mandibles, varies according to the distance of these apart. In some species, e. g. *Dorcus antæus*, they are very widely separated in the male and the clypeal process is correspondingly wide. It is generally very short, but sometimes, as in the genus *Lucanus*, may be produced in a downward direction so that the mouth becomes vertical instead of horizontal. The process may itself bear secondary processes. A remarkable example of this is seen in *Lucanus lunifer*, which bears a strange forked projection between the mandibles.

The labrum is completely united with the clypeus and never plainly visible, as it is in the PASSALIDÆ. The clypeal process is therefore called by Gravely the clypeo-labrum, the labrum itself being the outwardly invisible roof of the mouth. Equally immovable is the mentum, forming the floor. This is highly chitinized and generally broad. It is commonly different in male and female and may bear a thick clothing of hair beneath in the former. To the mentum is attached the ligula, which lies within the mouth and usually consists of two lobes fringed with long hairs. The short labial palpi, attached at its base, can be extruded or withdrawn. Also extrusible are the maxillæ, completely covered by the mentum when at rest, but with the long maxillary palpi exposed. The maxillæ bear brushes of long hairs, which serve to suck up the liquids which form the only nourishment of many of the adult insects. The maxillæ are not distinctly bilobed, as in the PASSALIDÆ, the inner lobe not being free, but there may be a small horny hook at its anterior end. This is found in both sexes in certain genera (*Figulus*, *Nigidius*, etc.), generally present in females but not males of *Dorcus*, *Cyclommatus* and related genera, and absent in both sexes of *Lucanus*, *Calcodes*, *Ægus*, etc.

The prothorax, as already mentioned, may differ greatly in the two sexes of the same species. It is generally rather short, and in many males, but never in the other sex, may be much smaller than the head. The base fits closely against the bases of the elytra and may be sharply angular at each end or curve gently round to the side. There is often an angulation of the lateral margin, which may be sharpened into a strong spine. By the obliteration of the hind angle this lateral angle may come to form a secondary basal angle, as in *Dorcus buddha*, etc. But there is also a tendency for a slight emargination to occur at the side just behind the front angle, and to become accentuated in such a way as to produce a spiniform angle at

its hinder limit, as in *Dorcus antæus*, etc. Accordingly there may be two lateral spines or angles, as in *D. elegans* and *westwoodi*, or, when there is a single lateral angle, this may have originated in either of the two ways.

The mesothorax nearly always forms a small scutellum between the elytra at their bases and this is usually very short, obtusely angled or semicircular. In the Figulinæ, however, the scutellum is very narrow and acutely angled, and in certain species of *Figulus* it is absent altogether.

The elytra completely cover the abdomen. They may be extremely glossy upon the back but the sides are often rougher and less shining than the dorsal part. Usually there is a gradual transition from rough to smooth surface but sometimes a sharp dividing line separates strongly contrasted inner and outer halves, as in *Dorcus bisignatus* and other species. The puncturation of the elytra is evenly distributed, without linear arrangement, and although deep longitudinal grooves occur upon the surface in some genera and in the females of certain species such as *Dorcus reichei*, serial puncturation of the type common in other groups of beetles, probably representing the ancient wing-venation, is usually absent in Lucanidæ. With certain exceptions the shoulders of the elytra are square and generally sharply angular. The wings do not differ in any important respect from those of other Lamellicornia. The abdomen presents five chitinous sternites on the lower surface and, except in a greater or less density of puncturation, these undergo exceedingly little change of form. Although this is a part of the body that in other Lamellicorn groups is especially liable to show sexual differences, in the Lucanidæ these are almost entirely absent.

The genital organs of the male present certain peculiarities. They consist essentially of an outer tube (tegmen) terminating in two lateral lobes, through which passes an inner tube, also bilobed at the end. To the membranous sac contained in this is attached a very long flexible filament (the flagellum), the extremity of which assumes different forms. These structures are not very hard and their relative positions vary. There is a tendency at the present time to regard the genitalia of male insects as free from the variability which affects other parts of the body and, where very well differentiated species are found, considerable constancy is, no doubt, to be found in these structures also. But in wide-ranging forms, examples of which from adjoining areas are indistinguishable, while those from regions far apart show local variations, variation can be traced in the genitalia of the same kind as in the external features. Differences found in individual specimens must therefore be regarded with the same caution as is necessary with the so variable external male features of these insects.

Striking series of figures representing the variation of the male ædeagus within a single species (*Pachyrrhinadoretus rugipennis*) have been published by myself in Plate V of the volume on RUTELINÆ, etc., of this series. Similar variation in the common European Rose-beetle (*Cetonia aurata*) has been illustrated by Curti (Entom. Mitth. vol. ii, 1913), and Cazier has more recently shown the same in a North American Melolonthid, *Phobetus comatus* (Pomona Coll. Journ. Ent. 1937, pl. 2).

Key to the Subfamilies of LUCANIDÆ.

1 (6) Tarsi normal, flexible, 5-jointed.
2 (5) Front coxæ not protruding ; 2nd joint of the labial palpus relatively short.
3 (4) Scutellum broad, obtuse-angled ; pulvillus well developed ; maxillary hook absent in the male, usually present in the female .... LUCANINÆ, p. 40.
4 (3) Scutellum absent or narrow and acute-angled ; pulvillus invisible : maxilla with strong chitinous hook in male and female .... FIGULINÆ, p. 212.
5 (2) Front coxæ protruding ; 2nd joint of the labial palpus very long .... ÆSALINÆ, p. 229.
6 (1) Tarsi solid, short and thick .... PENICHROLUCANINÆ. [p. 233.

Subfamily LUCANINÆ.

Male and female more or less dissimilar.

Legs of normal form, generally more slender in the male, the front coxæ not prominent, the tarsi slender, claws long and pulvillus well developed. Scutellum transverse, its apex obtuse. Maxillæ without chitinous hook, except in some females. Labial palpi with the 1st joint long and the 2nd short.

This subfamily includes the great majority of all the LUCANIDÆ and all those of large size, in which the two sexes differ in a striking degree ; but together with these highly developed forms are found, in each of the large genera, smaller species in which the male features are only poorly developed and the two sexes not very dissimilar.

Key to the Genera of LUCANINÆ.

1 (10) Eyes not completely divided.
2 (3) Middle tibiæ always and hind tibiæ usually bearing two or more lateral spines .... LUCANUS, p. 41.
3 (2) Four posterior tibiæ with not more than one lateral spine each.
4 (5) Front tibia at the end simple, not forked or divided .... CYCLOMMATUS, p. 63.

5	(4)	Front tibia forked or divided at the end.	
6	(7)	Club of the antenna composed of five or six joints	HEXARTHRIUS, p. 67.
7	(6)	Club of the antenna composed of three joints.	
8	(9)	Pronotum widest at the front margin and abruptly narrowed at the base.	GNAPHALORYX, p. 75.
9	(8)	Pronotum not widest at the front margin and abruptly narrowed at the base	DORCUS, p. 77.
10	(1)	Eyes completely divided.	
11	(14)	Four posterior tibiæ bearing lateral spines.	
12	(13)	Eyes extremely small ; four posterior tibiæ dilated at the end	AULACOSTETHUS, [p. 173.
13	(12)	Eyes not extremely small ; four posterior tibiæ not dilated at the end. .	ÆGUS, p. 174.
14	(11)	Four posterior tibiæ without lateral spines.	
15	(16)	Pronotum with lateral and hind angles.	CALCODES, p. 184.
16	(15)	Pronotum without lateral or hind angles..........................	HETEROCHTHES, p. 211.

Genus **LUCANUS.**

Lucanus Scopoli, Entom. Carniolica, 1763, p. 1 ; Lacord., Gen. Col. iii, 1856, p. 22 ; Parry, Trans. Ent. Soc. Lond. (3) ii, 1864, p. 71 ; Planet, Essai Monographique sur les Coleoptères des genres Pseudolucane et Lucane, 1898–1899.

Pseudolucanus Hope & Westw. (subgenus), Cat. Luc. Col. 1845, p. 30 ; Planet, *op. cit.* pt. 1, p. 9 ; Arrow, Trans. R. Ent. Soc. Lond. lxxxiii, 1935, p. 106.

TYPE, *Lucanus cervus* L.

Range. Europe, Continental Asia, Japan, Formosa, North and Central America.

Body clothed with hair beneath, the hair usually rather long and thick on the metasternum, the upper surface generally more or less clothed with very fine close-lying greyish hair, but sometimes almost naked. Front tibia with lateral teeth and terminal fork, the middle tibiæ always and hind tibiæ almost always bearing two or more lateral spines, their extremities acutely trilobed in the females (and sometimes also in the males). Claws and pulvillus long. Antenna with the club usually composed of four, but sometimes of more, joints. Eyes prominent, only divided in front. Maxilla with long, slender and very hairy outer lobe, the inner lobe without chitinous hook ; maxillary palpus with the 2nd joint slender, 3rd short, 4th rather long. Mentum semicircular, ligula long, terminating in two spatulate, scarcely diverging lobes ; labial palpus with the 1st joint long, 2nd short, 3rd elongate oval. Prosternum rounded behind and sometimes a little compressed.

♂. Head large, with its outer margins nearly always more or less crowned with strong ridges. Legs, antennæ and palpi very long and slender. Mandibles long, generally very greatly developed. Epistome vertically produced and narrow, often with a clypeal process, sometimes forked, above.

The variable number of joints forming the club of the antenna is a remarkable feature of the genus. This is probably not a primitive survival, but a late development by which an increase of sensory surface has been acquired. Sexual dimorphism occurs in almost every degree of development in the different species, from the extreme found in the largest specimens of *L. laminifer* and *cantori* to its almost total absence in *L. gracilis*, of which the male originally described was supposed to be a female. The primitive Priodont form of the mandible, with straight, serrate inner edge, does not occur in *Lucanus* and dimorphism of the male, as found in *Calcodes*, etc., is unknown.

The clypeal fork found in *L. lunifer* and other species is a very peculiar feature but it is absent in most of the species and, no doubt, in very small specimens of all. It is noteworthy that, although the length of this structure increases with increased size of the specimen, the bifurcation diminishes.

Key to the Species of Lucanus (males).

1	(26)	Front tibia not finely serrate externally.	
2	(3)	Head with a median and two lateral processes rising abruptly	*laminifer* Wat., p. 44.
3	(2)	Head without abruptly rising processes.	
4	(9)	Clypeal process forked.	
5	(6)	Middle and hind femora blotched with red	*lunifer* Hope, p. 45.
6	(5)	Middle and hind femora entirely dark.	
7	(8)	Upper surface closely hairy	*furcifer*, sp. n., p. 46.
8	(7)	Upper surface not closely hairy	*fryi* Boil., p. 48.
9	(4)	Clypeal process not forked.	
10	(21)	Middle and hind femora and tibiæ with red or yellow stripes or blotches.	
11	(18)	Elytra more or less hairy.	
12	(17)	Elytra not or scarcely metallic.	
13	(16)	Posterior lobes of the head broadly rounded.	
14	(15)	Pronotum and elytra very finely and densely punctured	*smithi* Parry, p. 49.
15	(14)	Pronotum and elytra less finely and densely punctured	*villosus* Hope, p. 50.
16	(13)	Posterior lobes of the head narrowly rounded	*cantori* Hope, p. 51.
17	(12)	Elytra metallic green or coppery.....	*mearesi* Hope, p. 52.
18	(11)	Elytra not hairy.	[p. 54.
19	(20)	Prothorax narrow	*fairmairei* Planet,

20	(19)	Prothorax broad	*groulti* Planet, p. 55.
21	(10)	Middle and hind legs uniformly dark.	
22	(25)	Pronotum not shining.	
23	(24)	Hind angles of the pronotum rounded.	*dohertyi* Boil., p. 56.
24	(23)	Hind angles of the pronotum distinct	*westermanni* Hope, [p. 57.
25	(22)	Pronotum shining in the middle	*atratus* Hope, p. 58.
26	(1)	Front tibia finely serrate externally.	
27	(28)	Upper surface black	*oberthuri* Planet, p. 59.
28	(27)	Upper surface metallic green or coppery.	
29	(30)	Body short and broad.	*lesnei* Planet, p. 60.
30	(29)	Body long and narrow	*gracilis* Albers, p. 61.

Key to the Species (females).

1	(2)	Hind angles of the pronotum rounded.	*laminifer* Wat., p. 44.
2	(1)	Hind angles of the pronotum distinct.	
3	(22)	Front tibia not finely serrate externally.	
4	(11)	Lateral angle of the pronotum very blunt.	
5	(8)	Femora blotched with yellow.	
6	(7)	Elytra very dull	*cantori* Hope, p. 51.
7	(6)	Elytra shining	*fairmairei* Plan., p. 54.
8	(5)	Femora not blotched with yellow.	
9	(10)	Elytra smooth, shining, very feebly punctured	*mearesi* Hope, p. 53.
10	(9)	Elytra closely punctured and hairy. .	*lunifer* Hope, p. 45.
11	(4)	Lateral angle of the pronotum well marked.	
12	(21)	Head angulate before the eye; elytra very closely punctured.	
13	(81)	Head with a slight curved ridge above the eye.	
14	(15)	Lateral angle of the pronotum very sharp	*furcifer*, sp. n., p. 47.
15	(14)	Lateral angle of the pronotum not very sharp.	
16	(17)	Sides of the pronotum coarsely punctured, elytra not long and narrow. .	*westermanni* Hope, [p. 57.
17	(16)	Sides of the pronotum not coarsely punctured, elytra long and narrow .	*fryi* Boil., p. 48.
18	(13)	Head without curved lateral ridges.	
19	(20)	Sides of the pronotum very finely sculptured	*smithi* Parry, p. 49.
20	(19)	Sides of the pronotum coarsely sculptured	*villosus* Hope, p. 50.
21	(12)	Head not angulate before the eye, elytra sparsely punctured.	*atratus* Hope, p. 58.
22	(3)	Front tibia finely serrate externally.	
23	(26)	Elytra black.	
24	(25)	Elytra not very shining	*oberthuri* Plan., p. 59.
25	(24)	Elytra very shining	*groulti* Plan., p. 55.
26	(23)	Elytra metallic	*lesnei* Plan., p. 60.

The females of *L. dohertyi* and *gracilis* are at present unknown.

1. **Lucanus laminifer.** (Plate III, fig. 5; Plate V, fig. 2.)

Lucanus laminifer Wat.,* Ann. Mag. Nat. Hist. (6) v, 1890, p. 33; Aid to the Identification of Insects, ii, 1890, pl. 186, figs. 4 & 5; Planet, Essai Monogr. ii, 1899, p. 53, figs. 27 & 28.

Reddish-brown or chocolate, with the outer margins dark and parts of the femora and tibiæ red. The body clothed above and beneath with fine close-lying greyish hair; the female darker in colour, with a sparser clothing, the femora and tibiæ black. The body is convex and rather elongate. The club of the antenna consists of four long joints of equal length. The prosternum only slightly prominent behind and rounded.

♀. The *head* is closely and coarsely rugose and rather sharply angulate on each side before the eye. The *pronotum* is smooth and shining in the middle, where it is finely and sparsely punctured, closely punctured at the front margin and very densely punctured and opaque at the sides. The front angles are blunt, the sides rounded to the lateral angle, which is blunt but distinct, and nearly straight to the hind angle, which is broadly rounded. The *scutellum* is closely punctured. The *elytra* are finely punctured and shining near the suture, the punctures becoming closer towards the sides and apices, where they are very dense.

♂. The *head* is short but not wide and the mandibles are very slender and not far apart. The upper surface of the head is coriaceous and opaque and bears three transversely placed strong erect elevations, one in the middle and one on each side near the hind margin, rather widely separated and a little oblique. The front angles of the head are sharply produced laterally and the eye-ridges fairly prominent at the end. The epistome is long, narrow and sharply pointed, and there is a strong transverse clypeal ridge, sometimes straight and sometimes curved. The *pronotum* is finely and closely punctured in the middle, densely rugose and opaque at the sides. The front angles are acute, the sides nearly straight to near the middle, where they are bluntly angulate, and nearly straight from there to the blunt hind angles. The *elytra* are finely and closely punctured upon the dorsal part, the punctures becoming denser towards the sides, and the lateral part finely rugose and opaque. The front *tibia* has a rather long terminal fork, succeeded by about four sharp lateral teeth, and there is also a long sharp tooth at the point of insertion of the tarsus on the lower surface. The *mandibles* are very long and slender and bear numerous small tubercles along the inner edge, a tooth at the base on the dorsal side and a longer one beneath, a little farther forward.

* An asterisk after the name of a species indicates that a type or co-type has been examined.

Variation of the male. In small specimens the head is rather narrow and the median process is conical and pointed. The mandibles are arched, the tips gently incurved and the tubercles crowded and irregular. In larger specimens the head is broader, the median process broad and truncated, the mandibles are greatly lengthened with the middle part approximately straight, the tubercles may be more scattered and the tip is forked. In the largest examples the tooth beneath the front tibia is conspicuously long.

♂. *Length* (with mandibles), 42–80 mm.; (without mandibles) 32–50 mm. : *breadth*, 13–20 mm.

♀. *Length*, 30–38 mm. ; *breadth*, 12·5–15 mm.

ASSAM : Naga Hills (*W. Doherty*) ; Manipur (*W. Doherty*). BURMA : Ruby Mines (*W. Doherty*).

Type in the British Museum.

2. **Lucanus lunifer.** (Plate III, fig. 3 ; Plate V, fig. 1.)

Lucanus lunifer Hope, Royle's Illustr. Nat. Hist. Himalayas, i, 1839, p. 55, pl. 9, fig. 4 ; Planet, Essai Monogr. ii, 1899, p. 12, figs. 5 & 6.

Black or nearly black, the elytra reddish-brown in the male, in which sex there is usually a very faint metallic suffusion of parts of the upper surface. The body clothed with fine yellowish hair, which is rather long and close upon the metasternum. Each elytron has a longitudinal elevation in its posterior lateral part, sometimes absent in the female. The club of the antenna consists of four long lamellæ of equal length.

♀. The colour is darker than that of the male and the legs are entirely black. The shape broadly oval and convex. The *head* is coarsely rugose, the eye-ridge angulate in front and behind. The *pronotum* is rugosely punctured at the sides, finely and closely in the middle. The front angles are rather sharp, the sides rounded to the blunt lateral angle and feebly concave to the distinct but obtuse hind angle. The *elytra* finely and closely punctured, but shining, except at the apices, which are densely punctured.

♂. Colour very dark brown, the tibiæ and the abdomen in part deep red. The *head* is densely coriaceous and opaque, its margins outlined by a strong ridge nearly straight in front and interrupted in the middle behind. The *clypeal process* is very long and strongly forked at the end, the epistome acutely pointed. The front angles of the head are sharply produced outwards. The *pronotum* is finely rugose and opaque, except in the middle, where it is rather indistinctly punctured and has a faint median groove. The front angles are strongly produced but not sharp, the side nearly straight to the very strong but blunt lateral angle and again nearly straight to the

well-marked hind angle. The *elytra* are extremely finely punctured and slightly shining, except at the apices. The *legs* are very slender ; the lateral teeth of the front tibia are not strong, the terminal fork is long and there is a long process beneath at the point of insertion of the tarsus. The middle and hind tibiæ bear strong lateral spines and terminate in three sharp spines.

Variation of the male. In small specimens the front cephalic ridge is only slightly indicated, the clypeal fork is represented only by a lobe on each side of the epistome and the mandibles are slender, gently curved and scarcely toothed except just before the tip. Larger examples have the frontal ridge a little elevated in the middle, a strongly diverging clypeal fork, a small tooth near the middle of the mandible and a few minute tubercles between this and the terminal fork. In full-sized males the clypeal fork is long but not strongly divergent, the frontal ridge is very strongly elevated in the middle and the mandibles are stout, with a strong tooth in the middle and very strongly diverging tips.

♂. *Length* (with mandibles), 47–82 mm. ; (without mandibles) 36–62 mm. : *breadth*, 15–23 mm.

♀. *Length*, 33–43 mm. ; *breadth*, 15–19 mm.

UNITED PROV. : Dehra Dun (*H. Maxwell Lefroy*) ; Mussoorie (*B. N. Chopra*, June, July). SIKKIM : Gopaldhara, Rungbong Valley (*H. Stevens*). Bengal : Kurseong, 6000 ft. (*E. A. D'Abreu*). PUNJAB : Dalhousie (*Capt. E. P. Sewell*). BURMA. TIBET (*W. Savage Landor*).

Type unknown.

This species is especially found in rotten stumps of oak and of *Castanopsis hystrix*, according to E. P. Stebbing and E. A. D'Abreu.

3. **Lucanus furcifer,** sp. n. (Plate III, fig. 4.)

Lucanus singularis Planet, Le Naturaliste, 1903, p. 12, figs. 1 & 2 (not *L. singularis* Plan., *op. cit.* 1900 (2) xiv, p. 11) ; Essai Monogr. ii, 1899, p. 22, fig. 9.

Black, with the prothorax and elytra of the male steely black and the tibiæ deep red. There is a clothing of pale hair, very scanty upon the upper surface of the female, fairly close upon that of the male and dense upon the lower surface. The club of the antenna composed of four equally long joints and the preceding one not produced. The prosternum prominent and rounded behind.

♀. Long and narrow, shining above, uniformly black above and beneath, including the tibiæ, the elytra non-metallic but occasionally with a very deep brown-black suffusion. The *head* is coarsely and rugosely punctured, with an oblique ridge on each side near the eye. The *pronotum* is closely punctured

in front and at the sides. The lateral margins are acutely angulate behind the middle, gently rounded from there to the front angles and feebly concave to the hind angles, which are well marked but not acute. The *scutellum* is finely and closely punctured. The *elytra* are finely and closely punctured but not opaque at the sides, shining dorsally, where they are very lightly and minutely punctured. The front *tibia* is produced at the end and not very deeply bifurcated.

♂. The *head* is finely and densely granular and opaque, and surrounded by a ridge, which is straight in front and broadly interrupted behind. There is a long clypeal process, dilated and forked at the end. The anterior angles of the head are rather sharp and prominent. The *pronotum* is finely coriaceous and shining, with the sides densely punctured and opaque. The lateral margins are strongly angulate in the middle, the front angles are sharply produced and the hind angles rather blunt. The *scutellum* is closely punctured. The *elytra* are moderately shining, finely and closely but not deeply punctured, and there are two or three lightly indicated longitudinal costæ. The front *tibia* is very slender, with the tip produced and strongly bifurcated, and a sharp spine near the base of the tarsus beneath. The long mandibles are a little expanded internally at the base by a feebly serrate ridge and beyond it are bent upwards and downwards. They bear a moderately long oblique tooth beyond the middle and are forked at the end. The inner edge before and after the tooth bears a number of fine but conspicuous tubercles.

Variation of the male. I have seen only well-developed male specimens. In the largest the mandibles are more strongly curved downwards than in those of moderate size, and the clypeal process is thickened at the end and its tips less divergent.

♂. *Length* (with mandibles), 54–70 mm.; (without mandibles) 39–49 mm. : *breadth*, 17–21 mm.

♀. *Length*, 31–37 mm. ; *breadth*, 13·5–15 mm.

Sikkim : Lachen Lachung, August (Oberthür collection). Yunnan. Szechuen : Ouy-Sy (*R. P. Mombelg*).

Type (from Yunnan) in the British Museum.

The species described above is that described and figured by Planet in 1903 as *Lucanus singularis*. *L. singularis* was originally described by him in 1900 (Le Naturaliste, xxii, p. 11) from a single female specimen which in my opinion is specifically different. The type, as described and figured, is singular in its narrow, parallel-sided form and smooth glossy surface. The female of the species described and figured three years later is not remarkable in these respects. As Planet's excellent figure shows, it scarcely differs from the female of *L. lunifer* except in the very acute lateral angles of

the prothorax. A feature particularly noted as distinctive of the true *L. singularis* is the comparative smoothness of the legs. Those of *L. furcifer*, on the contrary, are very strongly and closely sculptured.

At the end of this genus will be found a translation of the very imperfect description by Planet of the unique female type of *L. singularis*, which I have not been able to examine.

4. **Lucanus fryi.** (Plate IV, fig. 3; Plate V, fig. 3.)

Lucanus fryi Boil.,* Trans. Ent. Soc. Lond. 1911, p. 434, pl. 34, fig. 3.

Dark chocolate-brown, the legs entirely dark, the lower surface rather closely clothed with short pale yellow hair, the upper surface entirely bare, with the exception of the head, the scutellum and the base of the mandibles, as well as the sides of the pronotum in the male. It is a large stout-bodied species. The club of the antenna composed of four long, nearly equal lamellæ. The prosternum prominent, rounded and strongly compressed behind.

♀. Very dark, with the head and legs generally black, the upper surface not shining. The *head* is densely rugose, with the front angles acute and the eye-ridges rather prominent behind. There is a strong curved ridge on each side of the posterior part of the head. The *pronotum* is closely punctured, the punctures upon the anterior half larger and denser than those upon the posterior half. The lateral margin is gently rounded to beyond the middle, where there is a sharply defined angle, and gently concave to the hind angle, which is also sharply defined. The *elytra* are very finely punctured and rather closely so, except in the anterior dorsal part, where the punctures are few and very minute. The *legs* are stout; the front tibia ends in a long, very bluntly bilobed process, the lateral spines of the middle and hind tibiæ are strong and the hind tibia has three sharp terminal processes.

♂. The *body* is moderately elongate. The *head* is flat and surrounded by an elevated ridge rather broadly interrupted in the middle behind, the front angles sharp and double and the lateral lobes broadly rounded. There is a long clypeal process, not very broadly forked at the end. The *pronotum* is short and broad, finely rugose at the sides, where there is a thin clothing of short yellow hairs, and finely punctured elsewhere. The front angles are bluntly produced, the lateral margins very strongly but bluntly angulate in the middle and the hind angles sharply defined. The *elytra* are very finely punctured, closely, except in the anterior dorsal part, and densely at the apices. The front *tibia* is sharply toothed externally and the terminal fork is long. The terminal processes of the hind tibia are not long or sharp.

Variation of the male. In small specimens the frontal ridge is not sharp, the clypeal process is branched on each side before the end and the mandibles are simple and slender, with a small tooth before the tip. Larger examples have a distinct clypeal fork, the mandibles are forked at the tip and there is a small tooth near the middle. In large specimens the clypeal fork is long and narrow, the mandibles are more strongly rounded, the middle tooth is strong and has minute teeth before and after it, the terminal fork is very divergent and the frontal ridge of the head is elevated in the middle.

♂. *Length* (with mandibles), 39–70 mm.; (without mandibles) 30–52 mm. : *breadth*, 14–21 mm.

♀. *Length*, 31–45 mm. ; *breadth*, 13·5–19 mm.

Burma : Ruby Mines (*W. Doherty*) ; Kambaiti, 7000 ft. (*R. Malaise*, June).

Type in the British Museum.

The female specimen described by Boileau as belonging to this species, and labelled by him as a type, is quite different from the actual female, of which a considerable series was collected by Mr. Malaise together with the males. It is a much more smooth and shining insect, the pronotum has quite a different shape and the front tibia is short, without produced terminal fork. Being immature and deformed it must remain nameless.

5. **Lucanus smithi.** (Plate IV, fig. 4 ; Plate V, fig. 7.)

Lucanus smithi Parry, Proc. Ent. Soc. Lond. 1862, p. 108 ; Trans. Ent. Soc. Lond. 1864, p. 10, pl. 10, fig. 2.

Chocolate-brown, the female nearly black, clothed with yellow hair, sparsely above and closely beneath. The club of the antenna consists of four equally long joints and the preceding one is not produced. The prosternum very short and rounded behind.

♀. Very dark brown or black, rather shining above. The *head* is coarsely rugose, with fairly sharp front angles. The *pronotum* is finely and closely punctured in the middle and rugosely at the sides. The front angles are blunt, the sides well rounded to the rather sharp lateral angles, nearly straight from there to the similarly well-marked hind angles. The *scutellum* is closely punctured and clothed with hair. The *elytra* are finely and very closely punctured and shining but rather less so at the sides and apices, which are densely punctured.

♂. Rather short and compact. The femora and tibiæ are in part bright orange or red. The *head* and pronotum are dull, the head flat above, densely granular, surrounded by a ridge which is nearly straight in front and widely interrupted behind. The front angles of the head are sharply produced

outwards. The clypeal process short and pentagonal. The mandibles are not very long. The *pronotum* is closely punctured in the middle and finely rugose at the sides. The front angles are produced, not very sharp, the sides nearly straight to the rounded lateral angles and then almost straight to the well-marked hind angles. The *scutellum* is rugosely punctured and closely hairy. The *elytra* are very finely and closely punctured, rather shining dorsally but a little less so at the sides. There is a short laminar process beneath the front *tibia* near the point of insertion of the tarsus and the hind tibia ends in three sharp points.

Variation of the male. In a very small male the head is not wider than the thorax, the mandibles are short, slightly curved, and have only a single internal tooth situated towards the end. In larger examples this tooth is preceded and followed by smaller teeth and the tip is laterally compressed and bifurcated. There is also a stout basal tooth beneath the mandible. The largest specimens have the mandibles broad, strongly rounded in the basal half, with the post-median tooth broad at the base and closely preceded and followed by two or sometimes three small teeth. The head is very broad and the anterior ridge is elevated in the middle.

♂. *Length* (with mandibles), 25–46 mm.; (without mandibles) 21–36 mm.: *breadth*, 9–15 mm.

♀. *Length*, 26–29 mm.; *breadth*, 11·5–12·5 mm.

DARJEELING DISTR.: Kurseong, 6000 ft. (*E. A. D'Abreu*); Pedong (*L. Durel*); Mangpu (*E. T. Atkinson*); Gopaldhara, Rungbong Valley (*W. K. Webb*). SIKKIM: Tendong, 5000 ft., July.

Type in M. René Oberthür's collection.

6. **Lucanus villosus.** (Plate V, fig. 1.)

Lucanus villosus Hope,* Gray's Zoological Miscellany, 1831, p. 22; Planet, Essai Monogr. ii, 1899, p. 9, figs. 3 & 4.

Pitchy brown, with the elytra, femora, tibiæ and abdominal sternites red, all with dark margins, those of the elytra rather narrow and not well defined. The body clothed above and beneath with reddish hair, very short upon the upper surface and very scanty upon the elytra, except at the outer margin. The elytra very minutely punctured, densely at the sides, where they are subopaque, but moderately shining upon the inner part. The antennal club fairly long, the 7th joint almost as long as the last three.

♀. The *head* is densely and coarsely rugose, with the front angles sharp, but not produced. The *pronotum* is closely punctured, very strongly, except in the middle, where the punctures are not very fine. The sides are rather sharply angular in the middle and the front and hind angles are well

marked, but not acute. The front *tibia* is strongly bifurcate at the end.

♂. The *head* is densely coriaceous and opaque, its outer margin outlined by a strong ridge, interrupted in the middle behind and nearly straight in front. The anterior angles of the head are sharp, projecting a little beyond the eyes, and the eye-ridges are produced as minute spines at the end. The clypeus is not forked but has a slight two-cusped ridge and the epistome rounded, not acute, at the end. The *pronotum* is finely and densely granular and opaque, except in front of the scutellum. The front angles are sharply produced, the sides strongly but bluntly angulate behind the middle and the hind angles distinct but slightly obtuse. The shoulders of the *elytra* are sharply angular. The front *tibia* is very strongly and sharply toothed at the side and the prongs of the terminal fork are moderately long.

Variation of the male. The large type-specimen has the mandibles long and stout, gently curved outwards, rather strongly bent downwards, bifurcate at the end, with the prongs long and strongly divergent, a strong internal tooth near the middle and minute serrations between it and the terminal fork. In a smaller example (probably a co-type) in M. Oberthur's collection there is little downward curvature of the mandible, and the extremity, instead of a terminal fork, bears only a small tooth near the tip. The clypeus bears two slight lateral teeth.

♂. *Length* (with mandibles), 48–61 mm.; (without mandibles) 35–43 mm.: *breadth*, 15–19 mm.

♀. *Length*, 31 mm.; *breadth*, 13·5 mm.

NEPAL: (*Maj.-Gen. Hardwicke*).

Type in the British Museum; co-types (♂ and ♀) in M. Oberthür's collection.

7. **Lucanus cantori.** (Plate III, fig. 1; Plate V, fig. 4.)

Lucanus cantori Hope,* Proc. Ent. Soc. Lond. 1842, p. 83; Planet, Essai Monogr. ii, 1899, p. 57, figs. 29, 30.

Blackish-brown, with the elytra reddish-brown, except at the inner and outer margins, and the femora with the inner part, except at the ends, bright orange. The body clothed above and beneath with very fine close-lying yellowish-grey hair. Rather broad and convex. The club of the antenna composed of four long joints of equal length. The prosternum slightly prominent and rounded behind.

♀. The *head* is very densely rugose and only very bluntly angulate before the eye. The *pronotum* is strongly and closely punctured, densely and rugosely at the sides. The front angles are blunt, the lateral margins gently rounded to beyond the middle, where the angle is very blunt, and feebly concave

to the hind angles, which are well marked but not acute. The *scutellum* densely punctured. The *elytra* finely and very closely punctured, the sides and apices very densely. All the *tibiæ* bear very strong lateral spines.

♂. The *head* is very broad and the mandibles slender and widely separated at the base. The head is flat, finely and densely granular, the front angles strongly and sharply produced laterally, the posterior lobes of the head strong but not broad and the anterior ridge nearly straight. The eyes are prominent and the ocular canthi very feeble. The epistome is tapering, truncate at the end, with a 2-cusped clypeal process and a tooth on each side. The *pronotum* is short and narrow, finely coriaceous, with its front margin strongly trisinuate, the front angles bluntly produced, the lateral margin nearly straight to the middle, where the angle is broadly rounded, and again nearly straight to the blunt hind angle. The *elytra* are fairly broad, very finely and densely punctured, especially at the sides, which are opaque.

Variation of the male. In small specimens the head is much broader in front than behind, the mandibles gently rounded, with numerous blunt tubercles very irregularly scattered along the inner edge. In large examples the head is extremely broad, scarcely broader in front than behind, the mandibles are very strongly curved a little beyond the base and then rather straight, with blunt tubercles to a little past the middle, where there is a strong sharp tooth, followed by two or three more tubercles. The tip is slightly forked.

♂. *Length* (with mandibles), 50–72 mm.; (without mandibles) 38–57 mm.: *breadth*, 16–24 mm.

♀. *Length*, 40–42 mm.; *breadth*, 17–19 mm.

Darjeeling Distr.: Gopaldhara, Rungbong Valley (*W. K. Webb*); Pedong (*L. Durel*).

Type in the Hope Dept., Oxford University Museum.

According to E. A. D'Abreu (' The Beetles of the Himalayas ') the trees upon which *L. cantori* is chiefly found are *Castanopsis tribuloides* and *Symplocos theæfolia*.

8. **Lucanus mearesi.** (Plate III, figs. 2, 6.)

Lucanus mearesi Hope,* Proc. Ent. Soc. Lond. 1842, p. 83; Westw., Cab. of Orient. Ent. 1848, p. 21, pl. 10, fig. 1; Planet, Essai Monogr. ii, 1898, p. 17, figs. 7 & 8.
Lucanus nigripes Hope & Westw.,* Cat. Luc. Col. 1845, p. 10.

Rather narrowly elongate, the dorsal surface shining, coppery in the male, black in the female, the body clothed with yellow hair, close on the lower surface, almost absent from the greater part of the elytra. The club of the antenna consists of four long lamellæ, and the preceding joint is not produced. The prosternum short and rounded behind.

♀. The *head* is closely rugose, with the sides rounded in front and the eye-ridges rather prominent behind. The *pronotum* is finely punctured in the middle, strongly in front, coarsely and densely at the sides. The front angles are blunt, the sides gently rounded to the lateral angle, which is very blunt, and gently concave to the hind angles, which are well marked but not sharp. The *scutellum* is finely and closely punctured. The *elytra* are finely and rather closely punctured, except in the inner dorsal region, which is smooth and shining. The outer margins are rather narrowly opaque and sometimes feebly coppery. The *legs* are dark.

♂. Coppery or metallic green above, with the head and lower surface black or very dark brown, the femora and tibiæ in part purplish-red. The *head* is finely coriaceous, surrounded by a sharp ridge, nearly straight in front and widely interrupted behind. The clypeal process is long and pointed, the front angles of the head are rather sharply produced outwards. The *pronotum* is finely rugose at the sides and finely and closely punctured in the middle. The front angles are rather bluntly produced, the sides are nearly straight to the middle, where there is a rounded angle, and feebly concave to the hind angle, which is blunt. The *scutellum* densely punctured. The *elytra* very smooth and shining in the dorsal part and finely coriaceous and dull at the sides and apices. There is a short flattened tooth beneath the front tibia near the point of insertion of the tarsus and the hind tibia ends in three sharp points. The mandibles are very slender.

Variation of the male. In small specimens the mandibles are gently and uniformly curved. In large ones they are very strongly curved just beyond the base and then nearly straight. In the smallest examples they are irregularly toothed internally from near the base to beyond the middle and there is a small tooth beneath near the tip. In larger males the first and last teeth of the internal series persist and the intervening ones are obsolete. The basal tooth is flat, more or less bilobed and directed backwards. Another short sharp tooth appears beneath the mandible near the base. In large specimens the mandibles are very strongly forked at the end and the teeth are small.

♂. *Length* (with mandibles), 38–70 mm.; (without mandibles) 29–47 mm.: *breadth*, 11·5–19 mm.

♀. *Length*, 30–32 mm.; *breadth*, 12·5–13 mm.

Darjeeling Distr.: Kurseong, 5000 ft. (*N. Annandale*, Sept.); Kurseong, 6000 ft. (*E. A. D'Abreu*, July); Mangpu (*E. T. Atkinson*); Gopaldhara, Rungbong Valley (*W. K. Webb*); Pedong (*L. Durel*); Ghoom, 7000 ft. (*S. Kemp*).

Type in the Hope Dept., Oxford University Museum; also that of *L. nigripes*.

9. **Lucanus fairmairei.** (Plate IV, fig. 5.)

Lucanus fairmairei Plan., Le Naturaliste, 1897, p. 265; Essai Monogr. ii, 1898, p. 80, figs. 43 & 44.

Reddish-brown, very dark upon the head and thorax and the outer edges of the elytra, the male dull above, the female very glossy, the middle and hind femora blotched with orange, as well as the front femora and all the tibiæ in the male. The body rather narrow and clothed beneath with fine close-lying pale hair, to be found also upon the front of the head and the sides of the pronotum of the male. The club of the antenna consists of four moderately long lamellæ.

♂. Dull brick-red, the mandibles, head and thorax darker than the elytra. The *head* is very broad, densely granular and opaque, its outer margin outlined by a sharp ridge, nearly straight in front and interrupted in the middle behind, the front angles projecting laterally beyond the eyes, which are prominent. The posterior lobes of the head are broadly rounded. The clypeal process is short, bluntly produced in front and sharply elevated on each side at the base. The *pronotum* is narrow, densely granular, with the sides strongly but bluntly angular behind the middle and nearly straight to the front and hind angles, of which the former are strongly produced and the latter fairly sharp. The *scutellum* is strongly and closely punctured. The *elytra* are smooth but scarcely shining, very minutely and inconspicuously punctured, with the shoulders sharply angular, the outer margins gently rounded and the apices a little produced. The legs are very long and slender.

In well-developed males the head is very broad, the mandibles are rather long, gently rounded externally; the two branches of the terminal fork are nearly equal; there is a strong sharp tooth just before the middle of the inner edge, inclined slightly upward, and two or three small teeth before and after it.

Length (with mandibles), 46 mm.; (without mandibles) 31 mm.: *breadth*, 12 mm.

Burma: N. Chin Hills (*Lieut. E. Y. Watson*). Tibet: Se-Pin-Lou-Chan.

Type in M. René Oberthür's collection.

I have seen only a single male of the species. The Tibetan type-specimen is also a single male, but a female from China (represented in Planet's fig. 44) was associated with it by the author. It is not at all certain that he was right in this, but the species is closely related to the well-known Chinese *L. fortunei* Saund. and the female is no doubt much like that of *fortunei* shown in the photograph on Plate IV, fig. 9. The male differs from that of *fortunei* in having more convex, rather smoother and less distinctly punctured elytra, with

more prominent shoulders, nearly parallel sides and less produced extremities. The mandibles are more evenly curved and have fewer fine teeth before and behind the strong middle one.

10. Lucanus groulti.

Pseudolucanus groulti Plan.,* Le Naturaliste (2), xi, 1897, p. 227, fig.; Essai Monogr. i, 1898, p. 100, fig. 35 (not also fig. 36).

♀. Entirely black, shining and almost without hairy clothing above or beneath, rather rectangular in shape, the *head* coarsely rugose, the mandibles short, the basal half rugose, the terminal half shining, very sharply pointed, the inner tooth very feeble; *pronotum* smooth and shining in the middle, punctured at sides, rugose near front angles, which are sharp, the lateral margins strongly contracted behind, a little excised before the base, hind angles sharp and prominent, scutellum finely punctured; *elytra* smooth and shining except at the extremities. Front *tibia* stout, finely serrate between the terminal fork and the two or three upper teeth.

♂. Black, with the elytra and lower surface dark chocolate-brown, the lower surface clothed with yellow hair, not very conspicuous except upon the metasternum; the femora and tibiæ, except the front femora, blood-red, bordered with black.

Moderately elongate, not very shining, the *head* densely and confluently punctured, surrounded behind by a ridge, interrupted in the middle, the front angles blunt, eye-ridge with a minute posterior projection, the clypeal process short, transverse and tridentate in front; *pronotum* entirely covered with close and partly confluent punctures, with a deep median fovea in front of the hind margin, the lateral margins strongly dilated behind the middle and the hind angles extremely blunt; scutellum finely rugose; *elytra* finely and densely punctured, the punctures partly confluent, especially at the sides, and the shoulders rounded. Prosternum rounded behind. Front *tibia* fairly slender, the terminal fork long, tips not very divergent, outer edge without fine serration, spines of the middle and hind tibiæ not very long. Sixth joint of the antenna slightly produced, the club composed of four rather short lamellæ.

Variation of the male. The very small tooth at the inner edge of the mandible is sharp and simple in a small specimen, and broader, consisting of two cusps, in larger ones.

♂. *Length* (with mandibles), 32–39 mm.; *breadth*, 13–15 mm.

♀. *Length*, 34 mm.; *breadth*, 15 mm.

N. W. FRONTIER PROVINCE. UNITED PROVINCES: Kunayim, Bhawali, 5000 ft., June.

Type in M. René Oberthür's collection.

The two specimens described by Planet are without locality-labels and, as they were not originally associated, there is no reason to suppose that they were found in the same place. A pair presented to the British Museum by Mr. E. F. Gilmour were taken together in Bhawali, but the female does not agree with that described and figured by Planet, which no doubt belongs to another species. According to the author, it was considered by its former owner, Mniszech, to be a female of *L. westermanni*.

11. Lucanus dohertyi.

Lucanus dohertyi Boil.,* Trans. Ent. Soc. Lond. 1911, p. 435, pl. 34, fig. 2.
L. laminifer var. *minor*, Wat., Ann. Mag. Nat. Hist. (6), v, 1890, p. 33.

♂. Black or almost black, with the legs and abdomen very dark red, the lower surface clothed fairly closely with greyish hair, longest (but not very long) on the metasternum, the head, pronotum and scutellum clothed with very short, close-lying setæ and the elytra almost naked.

Broad and compact, with the head and pronotum opaque and the elytra rather smooth and shining. The *head* is not very broad, densely granular, surrounded by a ridge widely interrupted in the middle behind and a little elevated in the middle in front. The front angles are sharply produced laterally and the eye-ridge is rather prominent behind. The clypeal process is rather sharply produced and without lateral tubercles. The mandible is evenly rounded externally and bears a not very strong internal tooth beyond the middle and a smaller one midway between the last and the terminal fork. The antennal club consists of four long lamellæ, the first at least as long as those succeeding it. The *pronotum* is short, rugosely punctured at the sides and finely coriaceous in the middle, the lateral margins very strongly angulate behind the middle, nearly straight from the angle to the front and hind margins, the front angle a little produced, the hind angle rounded. The puncturation of the *elytra* is extremely fine except at the sides and apices; the latter only are opaque. The *prosternum* is not prominent behind. The outer edge of the front *tibia* is feebly crenulate (not finely serrate) and bears three or four sharp teeth, and the terminal fork is long but not strong. The four posterior tibiæ are very strongly spined externally and the middle ones are sharply tridentate.

Length (with mandibles), 48 mm.; (without mandibles) 38 mm.: *breadth*, 16·5 mm.

Assam: Naga Hills (*W. Doherty*).

Type in the British Museum.

This species closely resembles *L. westermanni*. Only a single male, probably not of full development, is at present known. It has the dark colour and broad form of *westermanni*, but the thorax is rather differently shaped. It is very short, strongly, not sharply, angulated at the side, with blunt hind angles. The mandible has more than one tooth in addition to the terminal fork. The clypeal process is more sharply produced and without distinct lateral tubercles, although it is possible that these are to be found in larger specimens. The seventh antennal joint forms a process at least as long as the succeeding one.

12. **Lucanus westermanni.** (Plate IV, fig. 2.)

Lucanus westermanni Hope & Westw.,* Cat. Luc. Col. 1845, p. 10; Planet, Essai Monogr. ii, 1899, p. 3, figs. 1 & 2.
+. *Pseudolucanus mniszechi* Plan.,* *op. cit.* p. 100, fig. 52.

Dark chocolate-brown, the elytra sometimes a little paler, the legs uniformly dark, the upper surface clothed sparsely and the lower surface rather closely with short yellowish hair. The club of the antenna is composed of four lamellæ, the last three long and the preceding one a little shorter. The prosternum is short and rounded behind.

♀. Convex and rather short and broad. The *head* is closely rugose, with a rounded ridge on each side behind, the sides nearly straight and parallel in front of the eyes and the front angles fairly sharp. The *pronotum* is finely and closely punctured in the middle and very densely at the sides. The front angles are very blunt, the sides gently rounded to the lateral angle, which is fairly sharp, and nearly straight to the well-marked hind angle. The *elytra* are finely and closely punctured, densely at the sides and apices.

♂. Moderately broad and compact. The *head* and pronotum are opaque, the head flat above, densely granular, surrounded by a ridge which is nearly straight in front and widely interrupted behind. The front angles are sharp and duplicated beneath and the eye-ridge is rather sharply prominent behind. The clypeal process is bluntly pointed and bears a small tubercle on each side. The mandibles are not very long. The *pronotum* is closely and finely rugose, with distinct punctures only in the middle. The front angles are bluntly produced and the sides feebly sinuate to the rounded lateral angles and nearly straight to the rather sharp hind angles. The *scutellum* is closely punctured. The *elytra* are very finely punctured but smooth and rather shining, except at the sides and apices, which are finely rugulose. The front tibia has a long terminal fork and a very sharp conical process beneath near the base of the tarsus. The hind *tibiæ* end in two strong processes with a blunt angle between them.

Variation of the male. In the smallest specimens the clypeal process is short, rounded in front and without lateral processes, and the mandibles are simple, with a very feeble internal tooth beyond the middle. In larger specimens there is also a tooth before the tip and the clypeal process is long, pointed and bears a small tubercle on each side. In large examples the mandible has a fairly strong tooth beyond the middle, there is a very small tooth beneath near the base and the extremity is equally bifurcate. The clypeal process is sharply pointed and strongly tuberculate on each side.

♂. *Length* (with mandibles), 29–52 mm. ; (without mandibles) 24–41 mm. : *breadth*, 12–17 mm.

♀. *Length*, 26–33 mm. ; *breadth*, 11–14 mm.

Sikkim : Gopaldhara, Rungbong Valley (*H. Stevens*). Darjeeling Distr. : Darjeeling, 7000 ft. (*F. H. Gravely*, April, May) ; Kurseong, 6000 ft. (*E. A. D'Abreu*) ; Mangpu (*E. T. Atkinson*) ; Pedong.

Type in the Hope Dept., Oxford University Museum ; that of *mniszechi* in M. René Oberthür's collection.

13. **Lucanus atratus.** (Plate IV, figs. 7, 8.)

Lucanus atratus Hope,* Gray's Zool. Misc. 1831, p. 22 ; Hope & Westw., Cat. Luc. Col. 1845, p. 10.
Pseudolucanus atratus Plan., Le Naturaliste, 1896, p. 278, figs. 1, 2, 3 ; Essai Monogr. i, 1898, p. 9, pl. 1, figs. 1, 2, 3.

Entirely black, rather smooth and shining, the lower surface clothed with yellow hair, long and close upon the metasternum. Small, rather short and convex in shape. The pronotum narrow, its front angles produced and fairly sharp, its sides very strongly but bluntly angulate in the middle and feebly concave from there to the hind angles, which are very sharp but not produced. The scutellum distinctly punctured, with scanty hairs. The elytra very glossy in the male and dull in the female. The club of the antenna rather long, the seventh joint a little shorter than the three terminal ones. The front tibiæ not finely serrate. The prosternum very prominent behind and bluntly pointed.

♀. The *head* is coarsely and closely rugose. The *pronotum* is entirely punctured, rather strongly and closely at the sides and finely and rather evenly elsewhere. The *elytra* are dull and finely punctured, the punctures rather sparse except at the sides, where they are moderately close. The front *tibiæ* are broad, with the terminal fork strong but not very divergent.

♂. The *head* is densely coriaceous and opaque and surrounded by a sharp ridge, which is gently curved in front and broadly interrupted in the middle behind, the front of the head vertical and the clypeal process very short, with rounded angles. The front angles of the head are very blunt, not projecting beyond

the eyes laterally and the eye-ridges are not sharp at the end. The mandibles are short and very strongly and regularly rounded, together forming more than half a circle, and each has a minute internal tooth near the middle, sometimes absent. The *pronotum* is distinctly, rather evenly but not closely, punctured and very shining, except at the sides, which are dull. The *elytra* are very smooth and shining, except at the extreme lateral margins and apices.

♂. *Length* (with mandibles), 28–41 mm.; (without mandibles) 25–34 mm.: *breadth*, 14–16 mm

♀. *Length*, 26 mm.; *breadth*, 12 mm.

NEPAL: (*Maj.-Gen. Hardwicke*). DARJEELING DISTR.: Ghoom, 7000 ft. (*S. Kemp*); Kurseong.

Type in the British Museum.

14. **Lucanus oberthuri.**

Pseudolucanus oberthuri Plan.,* Le Naturaliste, 1896, p. 279; Essai Monogr. i, 1898, p. 13, figs. 4 & 5.

Entirely black, the lower surface clothed with yellow hair, moderately long and close upon the metasternum. Fairly elongate and convex, with the prothorax rather narrow, its front angles sharp, the lateral margins very bluntly angular in the middle and the hind angles not very obtuse. The scutellum scarcely punctured behind, where there is a median carina. The elytra very glossy in the male, dull in the female, with the shoulders rounded and the apices sooty and opaque. The club of the antenna not very long, the seventh joint not quite as long as the three terminal joints, and the sixth slightly produced. The front tibia finely serrate and with three sharp lateral teeth. The prosternal process blunt.

♀. The *head* is coarsely rugose, with the exception of a small, smooth median patch behind, and the anterior angles are sharp. The *pronotum* is very finely and sparsely punctured, except at the extreme margins, which are closely punctured. The *elytra* are finely coriaceous and opaque, without visible punctures, but rather less dull in the anterior part. The front *tibia* is very broad, with the terminal fork strongly bilobed.

♂. The *head* is finely coriaceous and opaque, except in the posterior part, where it is shining, the upper surface surrounded by a ridge interrupted in the middle behind. The anterior angles project a little beyond the eyes. The mandibles are short and very strongly curved and each has a slight internal tooth near the middle. The *pronotum* is densely coriaceous and opaque, except in the middle, where it is shining and finely and sparingly punctured. The *elytra* are very smooth and shining, except at the extremities. The front *legs* are

long and slender, the terminal fork long, its tips not very divergent.

♂. *Length* (with mandibles), 31 mm.; *breadth*, 13 mm.

♀. *Length*, 34 mm.; *breadth*, 14 mm.

SIKKIM: Lingtu, Paramtsin.

Type in M. René Oberthür's collection.

The male type-specimen from which I have made the above description is a rather small individual. Its recorded habitat is Sikkim only. The female, from the locality given above, was captured seven years later.

L. oberthuri has a close resemblance at first sight to *L. atratus* Hope, but the points of difference are numerous. It is a more elongate insect, with the club of the antenna shorter in both sexes, but especially in the male, and with the front tibia finely serrate between the lateral teeth. The pronotum is less punctured, the lateral margins are less strongly angulate, and, in the male, only the median part is shining, the sides being finely rugulose and opaque. The extremities of the elytra are dull and sooty in both sexes.

15. **Lucanus lesnei.** (Plate IV, figs. 6, 10.)

Pseudolucanus lesnei Plan., Le Naturaliste, 1905, p. 212, figs. 1 & 2.

Black or deep reddish-black, the male coppery above, the female with dark coppery elytra, the lower surface clothed with yellowish hair, fairly long upon the metasternum. The elytra very glossy in both sexes. Moderately elongate and convex, with the front and hind angles of the pronotum sharply produced, the base strongly margined, with a slight fovea just before the middle. The scutellum punctured and clothed with fine hair. The club of the antenna short, the seventh joint a little shorter than the three terminal ones, and the sixth slightly produced. The front tibia finely and sharply serrate, with three or four rather larger lateral teeth. The middle tibia has about three lateral spines and the hind tibia only one.

♀. The *head* is much narrower than the prothorax, coarsely and rugosely punctured, with the sides rounded in front of the eyes, the clypeal process prominent, narrow and pentagonal. The *pronotum* is moderately shining, except at the sides, which are granular and opaque; it is very finely and sparsely punctured in the middle and more strongly and closely in front. The sides are gently rounded in front and strongly concave behind, the front angles fairly and the hind angles very sharp. The *elytra* are more glossy at the sides than in the dorsal part. The front *tibia* is very broad and very closely serrate laterally.

♂. The *head* is broader than the prothorax and very short.

The upper surface is closely granular and opaque and has a short oblique ridge on each side close to the eye and not continued behind. The clypeal process is short and broad, with sharp angles and acutely produced in the middle. The mandibles are short, not regularly rounded but bent near the middle, the terminal part very flat, straight and sharp. The *pronotum* is finely granular and opaque, the lateral margins strongly but not sharply angulate in the middle and gently concave to the front and hind angles, which are very acute. The *elytra* are extremely glossy. The *legs* are very slender, the front tibia very minutely serrate between the small lateral teeth.

Variation of the male. In a small specimen the mandibles are rather stout and have only a slight indication of a tooth near the middle of the lower edge. In a larger male they are more slender and have a laminar dilatation of the inner edge produced a little downward and forward.

♂. *Length* (with mandibles), 28–34 mm.; (without mandibles) 25–29 mm.: *breadth*, 12–13 mm.

♀. *Length*, 29–32 mm.; *breadth*, 13–14 mm.

Burma: Mishmi Hills, 2000 ft. (March to June).

Type probably in the Paris Museum.

The strong metallic lustre and very glossy elytra render this a readily recognizable species.

16. **Lucanus gracilis.** (Plate V, fig. 8.)

Lucanus gracilis Albers,* Deuts. Ent. Zeits. 1889, p. 319; Plan., Essai Monogr. ii, 1899, p. 130; Arrow, Trans. R. Ent. Soc. Lond. lxxxiii, 1935, p. 106.

Coppery-black, slightly shining above, except at the sides, which are dull and darker in colour, the head entirely black and dull, and the lower surface clothed with pale yellow hairs, fairly long and close upon the metasternum. Elongate and convex in shape. The club of the antenna consists of three moderately long joints and the seventh joint is produced. The prosternal process pointed but blunt.

♂. Long and narrow, with very slender legs. The *head* is small, with very short mandibles, finely coriaceous, except at the sides and in front, where it is rugosely punctured. The mandibles are extremely small and have the appearance of female organs, acutely pointed and interlocking, but shining, fairly slender and bearing a short but rather sharp tooth beyond the middle of the inner edge. The clypeal process is broad, dilating a little to the front edge, which is almost straight, with a short sharp tooth in the middle. The antennæ have a long, extremely slender scape, clubbed at the end, the sixth joint is a little produced and the seventh not much shorter than the three terminal joints. The eyes are small,

but prominent, the eye-ridge small, rounded and less prominent than the eye. The head bears a slight but sharp anterior ridge, a slight transverse depression behind the ridge and a short curved ridge on each side adjoining the eye. The *pronotum* is narrow, finely coriaceous, opaque at the sides but shining in the middle: there is an almost round depression just in front of the middle of the basal margin. The front angles are produced and fairly sharp, the sides curved to the middle, where they are bluntly angulate, and almost straight to the very blunt hind angles. The base is gently trisinuate. The *elytra* are moderately shining, except at the sides and apices, which are finely coriaceous, the shoulders rounded. The *tibiæ* are long and slender, the front tibia finely and closely but unevenly serrate, the middle tibia armed with about three fine lateral spines and the hind tibia with a single small spine placed at two-thirds of its length.

♂. *Length* (with mandibles), 31 mm.; (without mandibles) 28 mm.: *breadth*, 13 mm.

SIKKIM: Ratong Valley.

Type in the Hanover Museum.

Owing to its deceptive appearance the type-specimen was described as a female. By the kindness of Herr Nagel I have been able to examine it and to compare it with an exactly similar specimen in M. René Oberthur's collection. Both proved to be males. Females probably belonging to the same species are to be found in M. Oberthur's collection and in the British Museum. Those of the latter collection were taken in Tibet, one by Major R. W. G. Hingston in Rongshar Valley, 10,000 ft., June 1924, and two at Yatong, 10,500 ft., by Mr. A. E. Hobson. They resemble the male rather closely but the head is coarsely rugose and not dull, the pronotum roughly punctured at the sides and the elytra brownish and only feebly metallic. The legs are much less slender, the spines upon the middle and hind tibiæ much stronger and the antennæ shorter.

17. Lucanus singularis.

Lucanus singularis Planet, Le Naturaliste (2), xiv, 1900, p. 11, fig.; Essai Monogr. ii, 1899, p. 22, fig. 9.

I have not been able to examine the unique female specimen, the type of this species, which almost certainly does not belong to that described and figured under the same name three years later, to which I have given the name *Lucanus furcifer*. I therefore give here a translation of the original description of that specimen, identical in the two references quoted above.

"The male of this species is not known, but, to judge by the female, it must be near *L. lunifer*, for the resemblances

between the females of the two species are very great. The principal difference is in the form of the thorax, which, in *L. singularis* is much less convex, more angular at the median angles and much more contracted in front. It is also more finely bordered. It may be added that the mandibles are proportionally longer and that their inner edge, instead of being securiform, presents two distinct and separate teeth, that the epistome is longer and more slender, the granulation of the head less deep and the elytra more regularly parallel. The lamellæ of the antenna are shorter. The legs have the same structure but their granulation and puncturation are much feebler. The only example I know of this interesting species has been lent to me by M. H. Boileau and bears as sole indication of its origin : Indes orientales. The colour of this female is entirely black, the thorax and elytra are smooth and shining ; it is probable that they are covered with villosity in the natural state."

A single female specimen in the British Museum from S.E. Tibet (Zayul, 8000 ft) taken by Messrs. F. Kingdon Ward and R. J. H. Kaulback, probably belongs to this species.

Genus **CYCLOMMATUS.**

Cyclommatus Parry, Trans. Ent. Soc. Lond. 1863, p. 449.
Lucanus subg. *Cyclophthorus* Hope & Westw. (part), Cat. Luc. Col. 1845, p. 5 (preoccupied name).
Megaloprepes Thoms., Ann. Soc. Ent. France (4), ii, 1862, p. 420 (preocc.).
Cyclommatinus Did., Bull. Soc. Ent. France, 1927, p. 103 ; Arrow, Ann. Mag. Nat. Hist. (11) ii, 1938, p. 50.
Cyclommatellus Nagel, Stett. Ent. Zeit., xcvii, 1936, p. 293 ; Arrow, *loc. cit.*

TYPE, *Lucanus tarandus* Thunb. (Borneo.)

Range. The Indo-Malayan and Papuan regions.

The two sexes very dissimilar.

Eyes prominent and entire. Antennæ with a three-jointed club, the seventh joint sometimes strongly produced. Prothorax strongly contracted at the base, where it is much narrower than the elytra at the shoulders. Shoulders not sharply angular. Prosternum elevated between the front coxæ and sometimes a little produced. Legs slender, the front tibia acuminate, not forked at the end ; middle and hind tibiæ with a single lateral spine in the female, without spine in the male. Claws and pulvillus long. Maxilla long and narrow, with a chitinous hook at the inner edge in the female. Ligula slender, bilobed, the lobes narrow and diverging ; labial palpi with the first joint long, second short and third oval.

The antennæ of the male are extremely slender. The mandibles of the female are not flattened but compressed laterally, very strongly curved and bifid at the end. Those of the male are flattened and in well-developed specimens extremely long. The clypeal process of the female is more or less semicircular, that of the male produced. The front tibia of the female is sharply toothed laterally, that of the male is not, or only microscopically, toothed. The tip in both sexes is simple and not forked.

This is a well-marked genus more nearly related to *Dorcus* than to *Lucanus*. It is characterized especially by the simply acuminate tip of the front tibia. The dissimilarity between the two sexes both in size and form is remarkable. Another generic name, *Cyclommatinus*, has been introduced by Dr. Didier for *C. strigiceps* and related forms on account of the oblique scratches at the sides of the head in well-developed males, but, since these are absent in females and small males, its adoption would obviously entail difficulty which it is desirable to avoid. This applies equally to *Cyclommatellus* of Nagel.

Key to the Species of Cyclommatus (males).

Head not dark, scarcely metallic; pronotum without dark lateral patch	*strigiceps*, Westw., p. 64.
Head dark, strongly metallic; pronotum with dark lateral patch	*albersi*, Kraatz, p. 66.

Key to the Species (females).

Upper surface very closely punctured, not shining	*strigiceps*, Westw., p. 64.
Upper surface shining, not very closely punctured	*albersi*, Kraatz, p. 66.

18. **Cyclommatus strigiceps.** (Plate V, fig. 11.)

Lucanus strigiceps Westw., Cabinet of Oriental Entomology, 1848, p. 18, pl. 8, fig. 5.
Lucanus multidentatus Westw.,* *op. cit.* p. 17, pl. 8, fig. 3.

Orange-yellow or rusty-red, with the front and hind margins of the pronotum, the scutellum, inner and outer edges of the elytra, the antennæ and tarsi black or very dark. The pronotum may also have a dark longitudinal median stripe. Parts of the upper and lower surfaces of the male and the sides of the metasternum of the female slightly suffused with a greenish metallic lustre.

♀. Rather reddish in colour with the sides and middle line of the pronotum darker. The shoulders of the elytra are also dark and there may be a vague indication of a longitudinal dark line along the middle of each.

The *head* is coarsely and rugosely punctured, with a pair of

ill-defined roundish elevations in the middle. The *pronotum* is strongly and closely, and at the sides rugosely, punctured. The front angles are rounded, the sides feebly curved to the lateral angles, which are acute, and concave to the hind angles, which are rather sharp. The *scutellum* and the sutural edges of the elytra are shining. The *elytra* are densely punctured, but rather less so towards the suture than at the sides. The mentum is rugose, the metasternum bears rather scattered punctures and the abdomen is very closely punctured beneath. The front *tibia* bears about three or four fairly strong lateral teeth, the middle tibia a strong lateral spine and the hind tibia a very minute one. The seventh joint of the antenna bears a short process.

♂. Bright orange-yellow, with the mandibles, legs and lower surface reddish, the tibiæ and tarsi bearing conspicuous bright yellow fringes. The upper surface very smooth, the head and sides of the pronotum microscopically granular and opaque, the middle of the pronotum and the elytra shining. The front angles of the head rather prominent and the sides straight and parallel behind the eyes The *head* is rather hollowed in front and the clypeal process is triangular. The *pronotum* is short, with the front angles produced and rather sharp, the sides almost straight to the lateral angle, which is spiniform, and concave to the strongly marked hind angles. The antennæ and legs are very slender, the three club-joints of the former fairly long and the seventh joint produced into a long spine, as long as the club-joints. The tibiæ without lateral teeth or spines and the tarsi long.

Variation of the male. In small specimens the head is quite smooth, the mandibles flat, with their inner edges straight, close together and entirely serrate. In larger specimens only the basal part is serrate, the rest slender, with a tooth near the middle and another near the tip. Two or three longitudinal folds are visible on each side of the head. In full-sized males about six such folds can be counted on each side and the mandibles are long, curve gently downwards and have the lower edge armed with a strong tooth a little beyond the base, a smaller one past the middle and another before the apex. The hollowed anterior part of the head is limited behind by a fairly sharp curved carina.

♂. *Length* (with mandibles), 7–9 mm. ; (without mandibles) 17–22 mm. : *breadth*, 7–9 mm.

♀. *Length*, 16–18 mm. ; *breadth*, 7 mm.

Sikkim : Maria Basti. Darjeeling Distr. : Gopaldhara, Rungbong Valley (*W. K. Webb*).

Type in the Geneva Museum ; that of *multidentatus* in the British Museum.

19. **Cyclommatus albersi.** (Plate V, figs. 9, 10.)

Cyclommatus albersi Kraatz,* Deuts. Ent. Zeitschr. xxxviii, 1894, p. 268.
Cyclommatus vitalisi Pouill., Insecta, iii, 1914, p. 335, fig. 5.
Cyclommatinus vitalisi Did., Luc. du Globe, 1930, p. 131.

Bright yellow, with the head reddish in the female, brown, with a greenish metallic lustre in the male, the pronotum with the front and hind edges, the middle line and a lateral patch on each side black (with metallic suffusion in the male), the elytra with the shoulders and the inner and outer edges narrowly black. The antennæ and tarsi also black and the greater part of the legs and lower surface of the male dark metallic green. The elytra rather more elongate than those of *C. strigiceps*.

♀. Like that of *C. strigiceps*, but lighter in colour and more shining above, with the *head* strongly punctured, the *pronotum* strongly but not very closely, except at the sides, and the *elytra* rather closely but not densely. The lower surface has a slight metallic suffusion; the metasternum is very finely and sparsely punctured and the abdomen closely.

♂. Like that of *C. strigiceps*, but the head and mandibles darker, with a very distinct metallic suffusion; the pronotum has a dark lateral patch on each side, also with a metallic suffusion, and the elytra are a little paler in colour.

Variation of the male. I have seen only well-developed specimens of this species, which appears to attain a rather larger size than *C. strigiceps*. All the specimens have six or seven well-marked longitudinal folds on each side of the head. No doubt small examples closely resemble those of the related form.

♂. *Length* (with mandibles), 30–33 mm.; (without mandibles) 22–25 mm.: *breadth*, 8–9 mm.

♀. *Length*, 17 mm.; *breadth*, 7 mm.

ASSAM: Manipur (*W. Doherty*). BURMA: Cheba, Karen Hills, 2700–3300 ft. (*L. Fea*, December); Haka, Chin Hills (*F. Venning*, November); Nam Tamai Valley (*R. Kaulback*). TONKIN.

Type in the Deutsche Entom. Inst., Dahlem, Berlin; that of *vitalisi* in M. René Oberthür's collection.

This is very closely similar to *C. strigiceps* but appears to have a different and wider range. The female is easily recognized by the more shining upper surface and the male by the more metallic head and thorax and the dark lateral patches upon the latter. In specimens from Tonkin (*C. vitalisi*) the corrugation of the sides of the head of the male is not very distinct, but I cannot regard them as specifically different. A third closely related form in the Malay Peninsula is *C. pahangensis* Nagel.

Genus HEXARTHRIUS.

Lucanus subg. *Hexarthrius* Hope & Westw., Cat. Luc. Col. 1845, pp. 4, 30.
Cladognathus subg. *Hexarthrius* Burm., Handb. Ent. v, 1847, p. 365.

TYPE, *Lucanus rhinoceros* Oliv. (Java).

Range. The Indo-Malayan Region.

Club of the antenna composed of five or six joints, usually with the preceding joint also produced. Eyes incompletely divided. Middle and hind tibiæ each with a strong lateral spine in the female, the hind tibia of the male with only a vestige or none. Tarsi long in the male, rather short in the female. Clypeal process divided from the front by a sutural line. Maxillæ with a horny hook to the inner lobe in the female. Ligula composed of two slender, strongly divergent lobes, the labial palpi with the first and third joints long, the second short.

The mandibles in well-developed males of *Hexarthrius* are large. The species are of large size and closely related to *Dorcus* but with five or six joints instead of three in the club of the antenna. The males of most of the species are, at least in part, brown, red or yellow, whilst the known females are black, but two of the Indian species are at present insufficiently known and their females have not been distinguished. I have therefore had to omit them from my table of species.

Key to the Species of Hexarthrius (males).

1 (6) Head short, very broad in front, strongly contracted behind.
2 (5) Pronotum broadest before the middle.
3 (4) Elytra each decorated with a large yellow patch . . . . *parryi* Hope, p. 68.
4 (3) Colour uniformly reddish brown . . *forsteri* Hope, p. 69.
5 (2) Pronotum broadest behind the middle . . . . *mniszechi* Thoms., p. 71.
6 (1) Head longer, not very broad in front nor strongly contracted behind.
7 (10) Elytra very glossy.
8 (9) Lateral angle of the pronotum blunt. *bowringi* Parry, p. 72.
9 (8) Lateral angle of the pronotum sharp. *aduncus* Jord., p. 73.
10 (7) Elytra dull . . . . *davisoni* Wat., p. 74.

Key to the Species (females).

1 (4) Sides of the pronotum coarsely and closely punctured.
2 (3) Lateral angle of the pronotum very sharp . . . . *parryi* Hope, p. 68.
3 (2) Lateral angle of the pronotum very blunt . . . . *davisoni* Wat., p. 74.
4 (1) Sides of the pronotum feebly punctured.

5 (6) Shorter, the pronotum broad in front, narrow behind .... *forsteri* Hope, p. 69.
6 (5) Longer, the pronotum not broad in front nor narrow behind .... *mniszechi* Thoms., p. 71.

20. **Hexarthrius parryi.** (Plate V, fig. 6; Plate VI, fig. 3.)

Hexarthrius parryi Hope, Trans. Linn. Soc. Lond. xix, 1843, p. 104, pl. 10, fig. 2.

Black, the male with a large yellow patch occupying the posterior three-quarters of each elytron. Moderately elongate, not very shining. The lateral angle of the prothorax very sharp and the hind angles fairly well marked but not sharp. The prosternum forms a moderately broad, rounded and rather sloping lobe behind. The fifth joint of the antenna strongly produced.

♀. Entirely black, sometimes with a faint trace of brown upon the hinder part of the elytra. The *head* is rather uneven, coarsely and rugosely punctured, except in the middle of its posterior margin, where it is finely coriaceous. The *pronotum* is finely coriaceous, with coarse and close punctures at the sides, becoming gradually finer and fewer towards the middle, where they are absent. The front angles are rounded, the lateral margins finely and irregularly serrate, and gently curved to well beyond the middle, where there is a very sharp tooth, and then concave to the obtuse hind angle. The *scutellum* bears a few punctures and the *elytra* are finely and closely punctured, the sides and apices rather opaque and the remaining surface very feebly shining. The front *tibia* is finely serrate laterally with short sharp teeth and a short terminal fork, the middle tibia has a strong lateral spine and the hind tibia a small one.

♂. Black, with the elytra bright orange, their inner and outer margins narrowly, and the anterior part very broadly, black, the black border very sharply defined behind but rather vaguely in front. The *head* and mandibles are densely granular, the head more or less swollen on each side. The clypeal process is short, produced in the middle, where it forms a thin compressed lamina with the tip sharply reflexed. The sides of the head are sharply angular in front of the eyes and rather feebly angulate behind them, where the head is strongly contracted. The *pronotum* is short and broad, densely granular, rather coarsely at the sides and very finely in the middle, where there is a fine median groove. The outer margins are produced outwards as irregularly rounded lobes in front, then gently bisinuate to far behind the middle, where there is a very sharp spine, and gently concave to the obtuse but well-marked hind angle. The *elytra* are dull, except upon the inner posterior part, and the base and sides

are finely and closely punctured. The front *tibia* bears very sharp lateral teeth, the middle tibia a strong lateral spine and the hind tibia a feeble one.

Variation of the male. In small specimens the head is only very slightly convex on each side of the middle, the clypeal process is transversely pentagonal, the mandibles are feebly curved externally and slightly arched, with a small sharp inner tooth beyond the middle and another before the tip, the inner edge between the teeth finely crenulate. In larger specimens the head has a broad median depression and a distinct swelling on each side of it. The three anterior angles of the clypeal process are a little more prominent and the middle one is sharply reflexed. The mandibles are stouter, more strongly curved and arched but not longer relatively. There is a slight sharp tooth directed upwards at the base and a similar one beneath directed downwards. The post-median tooth is strong and sharp, there is a row of rather strong tubercles before and after the ante-apical tooth and the basal inner edge is finely crenulate. In large specimens the head is very broad and strongly swollen on each side and the mandibles are very stout.

♂. *Length* (with mandibles), 48–80 mm. ; (without mandibles) 37–61 mm. : *breadth*, 15–25 mm.

♀. *Length*, 40–44 mm. ; *breadth*, 16–20 mm.

Assam : Shillong, Khasi Hills ; Cachar ; Sylhet.

Type in M. René Oberthür's collection.

This is one of the most distinctive of all Indian species but it has a very close similarity to *Hexarthrius deyrollei* Parry, which has a wide distribution in Indo-China, the Malay Peninsula, Sumatra and Java. In that form the yellow elytral patch in the male is rather smaller, the two elevations upon the head are more strongly developed and conical and the upper basal tooth of the mandible is stronger and continued by a toothed ridge on the dorsal surface. The female is more elongate than that of *H. parryi*.

21. **Hexarthrius forsteri.** (Plate V, fig. 5 ; Plate VI, fig. 1.)

Lucanus forsteri Hope,* Trans. Linn. Soc. Lond. xviii, 1841, p. 587, pl. 40, fig. 1.
Hexarthrius forsteri Boil., Trans. Ent. Soc. Lond. 1913, p. 222.

Rather narrowly elongate, the male reddish-brown in colour, with the mandibles and elytra very glossy, the female black and rather dull. The lateral margins of the prothorax finely and irregularly serrate or crenulate and the hind angles well marked. The prosternum prominent and compressed but not produced behind. The fifth joint of the antenna strongly produced.

♀. Entirely black, not shining, not very long. The *head*

is opaque and strongly and closely punctured, except in the posterior median part, which is feebly punctured. The *pronotum* is short and broad, strongly narrowed at the base, very finely coriaceous, with fine punctures at the sides. The lateral margin is gently rounded to the lateral angle, which is not very well marked, and concave to the very distinct hind angles. The *elytra* are opaque at the outer margins, becoming gradually less so towards the suture, where they are almost shining. The front *tibia* is fairly slender, minutely serrate externally and feebly toothed, the extremity forked; the middle tibia has a very strong lateral spine and the hind tibia a feeble one.

♂. Reddish-brown, with the sides of head and pronotum, the inner and outer edges of the elytra, the antennæ and tarsi darker and the femora and tibiæ rather bright red. The *head* is densely granular and opaque, rather short, broad in front and narrowed behind the eyes, with a sharp angular prominence on each side before the eye and another less sharp behind it. The clypeal process is transverse, the angles sharply produced. The *pronotum* is short and broad, densely granular and opaque, its median part more lightly sculptured, with a faint median groove. The front angles are very blunt, the sides irregularly crenulate and feebly rounded to the sharp but minute lateral angle, which is situated far behind the middle, and concave to the hind angles, which are very distinct but not acute. The scutellum is smooth. The *elytra* are long and narrow, very smooth and shining, except at the extreme margins. The middle *tibia* has a strong spine and the hind tibia has none or a vestige only.

Variation of the male. In small males the angles of the clypeal process are scarcely produced and the mandibles are flat, very gently curved outwards but not arched. They bear only two or three minute teeth at the inner edge a little before the tip. In larger examples the mandibles are compressed and arched in the basal part and more strongly curved. There is a sharp tooth above at the base, directed obliquely backward, and another beneath just beyond the base, directed obliquely forward. The inner edge bears rather numerous small tubercles, very irregularly placed, from beyond the base to about the middle, followed by three rather larger isolated teeth at nearly equal distances. In large specimens the arching of the mandibles is accentuated, the outward curvature is very strong near the base and the upper and lower basal teeth are very large, the small tubercles in the middle region are reduced in size and extent and the three terminal teeth are enlarged, the middle one the longest and marking the situation of a rather abrupt inward bending of the extremity of the mandible,

♂. *Length* (with mandibles), 36–70 mm. ; (without mandibles) 28–51 mm. ; *breadth*, 12–20 mm.

♀. *Length*, 38 mm. ; *breadth*, 15·5 mm.

Assam : Shillong, Khasi Hills ; Jaintia Hills.

Type in the Hope Dept., Oxford University Museum.

22. **Hexarthrius mniszechi.** (Plate VI, fig. 5.)

Lucanus (*Hexarthrius*) *mniszechi* Thoms., Arch. Ent. i, 1857, p. 396 ; Lacord., Gen. Col. Atlas, pl. 24, fig. 5.

Black or very dark red-brown, the abdomen and elytra of the male a little more reddish than the rest of the body ; the female entirely black.

♀. Entirely black, narrow in shape, the surface dull. The *head* is flat and strongly punctured, except in its posterior part, the canthus rather prominent laterally. The *pronotum* is not very broad, smooth, with the sides finely and not very closely punctured, the lateral margin feebly angulate behind the middle, very feebly curved to the front angle and almost straight to the hind angle, which is obtuse. The *elytra* are smooth, except at the outer margins, where they are very shallowly punctured and very opaque. The front *tibia* is minutely serrate, sharply and finely toothed, the middle tibia armed with a strong lateral spine, the hind tibia with a feeble one.

♂. Rather narrow, with the mandibles, head and pronotum dull and the elytra very smooth and shining, except at the extreme margins. The *head* and mandibles are closely granular and opaque. The sides of the head are rather sharply angular in front of the eyes, convergent and rounded behind them. The canthus reaches the middle of the eye. The clypeal process is pointed in front and angular at the base on each side. The *pronotum* is closely granular, like the head, but more finely in its median part ; it is short and convex, the front angle produced, the outer margin almost straight to beyond the middle, where it is roundly and strongly bent. The hind angle is rounded and obsolete. The *scutellum* is finely granular. The *elytra* are very smooth and shining but the extreme basal and lateral margins are finely coriaceous. The *prosternum* is a little compressed behind but not pointed. The front *tibia* is long, its outer edge is finely serrate between the teeth, the terminal fork is long and the terminal spur hooked. The middle tibia bears a strong lateral spine and the hind tibia none or a vestige only.

Variation of the male. A small male is very narrow, the head (across the eyes) is only very slightly wider than the thorax, the sides are rather strongly swollen behind the eyes, the clypeal process is transversely pentagonal, the mandibles

slender, flat, gently curved, with numerous fine teeth at the inner edge in the front half. The front angles of the pronotum are little produced and the hind angles very obtuse. In well-developed males the head is much broader than the prothorax and elytra, a little hollowed in the middle, strongly contracted and only a little swollen behind the eyes, the outer angles of the clypeal process are sharply produced, the mandibles are very stout, not flat, rather straight except at the base and apex and deflected beyond the base, with a strong internal tooth placed considerably past the middle, a very minute one a little behind it, a small one just behind the tip and fine irregular tubercles between this and the strong tooth. The sides of the pronotum are perpendicular and the hind angles are broadly rounded and obsolete.

♂. *Length* (with mandibles), 48–77 mm.; (without mandibles) 35–52 mm.: *breadth*, 15–19 mm.

♀. *Length*, 35 mm.; *breadth*, 14 mm.

ASSAM: Sylhet; Sibsagar (*E. T. Atkinson*). BURMA: Kauri, Kachin Hills (*L. Fea*, August, November).

Type in M. René Oberthür's collection.

The two sexes were taken together by Fea and examples have been kindly lent to me for description by the Genoa Museum. The British Museum contains only large males.

23. **Hexarthrius bowringi.** (Plate VI, fig. 6.)

Hexarthrius bowringi Parry, Proc. Ent. Soc. Lond. 1862, p. 108; Trans. Ent. Soc. Lond. 1864, p. 12, pl. 9, figs. 5 & 7.

♂. Deep chocolate-red, with the head and pronotum, the antennæ and tarsi almost black. Narrow in shape, the surface dull but with very glossy elytra. The *head* is uniformly and densely granular, not very broad in front, the front angles moderately sharp, the sides gently rounded but not strongly convergent behind the eyes. The clypeal process is narrowly triangular and bluntly pointed. The middle of the head is slightly depressed. The mandibles have a downward curvature and are gently rounded externally. There is a short, rather broad, truncate tooth internally at a short distance from the base, a strong sharp tooth near the tip and a small one at a little distance behind it. The club of the antenna consists of five short lamellæ and the preceding joint is pointed but not produced. The *pronotum* is also densely granular and opaque, but less so in the middle than at the sides. It is rather narrow in front, the front angles are bluntly produced, the sides almost straight to the rounded lateral angles and almost straight from there to the strongly marked but not acute hind angles. The *elytra* are without distinct punctuation, the shoulders acute and the apices a little produced.

The front *tibiæ* are slender, the lateral teeth few and minute and the terminal fork long. The middle tibia has a strong lateral spine and the hind tibia has none.

♂. *Length* (with mandibles), 70 mm.; (without mandibles) 49 mm.: *breadth*, 20 mm.

"INDIA."

Type in the British Museum; co-type in M. René Oberthür's collection.

I have seen only the single male specimen in the British Museum, derived from the Bowring collection and of unknown origin. It may perhaps be an inhabitant of Burma.

24. **Hexarthrius aduncus.** (Plate VI, fig. 2.)

Hexarthrius aduncus Jord., Nov. Zool. i, 1894, p. 484, pl. 13, fig. 1

♂. Reddish-chocolate, with the head, mandibles and tarsi nearly black, the elytra deep red and the abdomen, femora and tibiæ bright red. Rather narrow in shape, with the head and pronotum dull and the mandibles and elytra smooth and shining. The *head* is densely granular, the front angles are rather sharp and the sides swollen behind the eyes. The fifth joint of the antenna sharply produced. The mandibles are slender, not strongly curved or deflected. The clypeal process is bluntly pointed and not toothed at the base. The sides of the *pronotum* are densely granular but the granules are finer and less dense in the middle. The front angles are rather sharp, the lateral margins irregularly dentate, almost straight to the middle, then rounded, with an acute lateral tooth beyond the middle, and almost straight to the hind angle, which is well marked. The *scutellum* is finely granular. The *elytra* are very smooth but the anterior part of the lateral margin is a little dull. The front *tibia* is slender, minutely serrate externally, with a few short teeth, the terminal fork is strongly bent downwards and there is a sharp spine beneath at the base of the tarsus. The middle tibia bears a strong lateral spine and the hind tibia has none. The *prosternum* is a little compressed behind but not pointed.

Variation of the male. In small specimens the mandibles are flattened, horizontal, gently curved externally and bear a small sharp internal tooth at the base and another a little before the tip. In medium-sized males a small internal tooth appears a little beyond the basal one and a still smaller one immediately before the tip. In large specimens the mandibles are not flattened, they are curved downwards but appear rather straight as seen from above, except at the base and extremity. The basal tooth is blunt and directed obliquely backwards and, in addition to the teeth, a few ill-defined and variable tubercles may be found at the inner edge.

The female is unknown.

♂. *Length* (with mandibles), 36–66 mm. ; (without mandibles) 27–46 mm. ; *breadth*, 12–19 mm.

ASSAM : Shillong, Khasi Hills ; Manipur (*W. Doherty*).

Type in M. René Oberthür's collection.

25. **Hexarthrius davisoni.** (Plate VI, fig. 4.)

> *Hexarthrius davisoni* Wat.,* Ann. Mag. Nat. Hist. (6) i, 1888, p. 260 ; Boil., Trans. Ent. Soc. Lond. 1913, p. 222.
> *H. castetsi* Boil., Ann. Soc. Ent. France, lxvi, 1897, p. 581, figs.
> *H. cotesi* Nonfr., Berl. Ent. Zeitschr. xxxvi, 1892, p. 365

Black, the elytra deep brick-red, with the sutural and lateral margins narrowly black, not sharply defined but passing into the red colour, the upper surface dull, not shining. Rather narrowly elongate, moderately convex, with slender legs, the four posterior legs each bearing a lateral spine. The antennal club consists of five joints, the preceding joint slightly produced. The prosternum prominent and compressed behind but not pointed.

♀. The upper surface is a little less dull than that of the male, but the head and the sides of the pronotum are rugosely punctured. The *head* is not very broad, the canthus not projecting laterally. The mandibles are rather narrow at the base and each has a small, rather sharp, tooth near the middle of the inner edge. The *pronotum* is finely and sparsely punctured in the median part and the punctures become progressively stronger and closer towards the sides. The front angles are bluntly produced, the lateral margins very feebly curved to beyond the middle, where they are bluntly angulate, and concave to the hind angles, which are fairly sharp. The *elytra* are very finely and closely punctured, the punctures becoming progressively closer from the suture to the outer margins, which are punctate-rugose and opaque. The front *tibia* is fairly stout, the outer edge unevenly serrate and the tip broadly forked.

♂. Entirely opaque above, except close to the elytral suture. The *head* is densely granular, the canthus projecting a little beyond the eye but not very sharply angular. There is a slight blunt prominence behind the eye. The clypeal process is triangular, fairly sharp, in front and bearing a blunt process on each side of the base. The mandibles are slender and not very stout. The *pronotum* is finely and very densely granular. The front angles are bluntly produced, the sides nearly straight and feebly divergent to beyond the middle, bluntly angular there and gently concave to the hind angles, which are well marked but not sharp. The *elytra* are opaque, except at the suture, where they are shining and almost smooth, but become gradually more closely coriaceous from there to the outer

margins. The shoulders are acutely angular. The middle *tibia* bears a strong lateral spine and the hind tibia a very minute one.

Variation of the male. The lateral processes of the clypeus vary according to the size of the specimen. They are absent in very small males, truncate in moderate-sized ones and produced at the inner angle of the truncation in the largest. The mandibles of small specimens are rather strongly curved externally, very sharply pointed and have only feeble indications of teeth at the inner edge, one beyond the base and one near the middle. In larger examples a third tooth appears before the tip. In large males the basal tooth is fairly strong, the second feeble, the third longer and a small fourth appears before the tip. The curvature is slight in large specimens.

♂. *Length* (with mandibles), 32–80 mm. ; (without mandibles) 27–57 mm. : *breadth*, 11–25 mm.

♀. *Length*, 31–35 mm. ; *breadth*, 12·5–15 mm.

MADRAS : Shembaganur, Madura (*Rev. P. Manuel*) ; Kodaikanal, Palni Hills, 6900–7200 ft. (*Mrs. Stanley Kemp*, August ; *P. V. Isaac*, September) ; Anaimalai Hills.

Type in the British Msueum ; that of *H. castetsi* Boil., in Dr. Didier's collection.

Genus **GNAPHALORYX.**

Gnaphaloryx Burmeister, Handb. Ent. v, 1847, p. 396 ; Lacord., Gen. Col. iii, 1856, p. 30 ; Arrow, Trans. Ent. Soc. Lond. lxxxiii, 1935, p. 113.

TYPE, *G. opacus* Burm.

Range. The Malayan Region.

Moderately elongate and depressed, the surface densely covered with pits containing an earthy matter and very short minute setæ. Legs slender, the femora very narrow, those of middle and hind legs rather strongly curved, the middle and hind tibiæ each bearing a single minute lateral spine. The four basal joints of the tarsi short, the fifth long, the pulvillus strongly developed. Eyes small but fairly prominent, not divided, the sides of the head toothed behind the eye. Mentum short and broad. Ligula very small, without produced lobes, the palpi with the first and third joints long and slender. Maxillæ with the lobes very small, without horny hook in either sex ; palpi well developed, the second and fourth joints very long. Pronotum short and broad, with the front angles truncate and sharply produced, the lateral angles sharp, the hind angles well marked and the base rather narrow. Scutellum not very broad, obtuse. Elytra rather long. Prosternum little elevated behind the front coxæ, not pointed,

♂. Mandibles moderately long. Sides of the head prominently lobed behind the eyes.

♀. Mandibles short, almost straight externally, not broad at the base. Front tibia very slender and strongly curved.

In spite of its very close relationship with the genus *Dorcus*, a number of peculiar features seem to justify the retention of a separate genus for *Gnaphaloryx opacus*, but I exclude from it various other species which have been associated with it, most of them belonging to the genus *Aegus*. The distinctive shape of the prothorax, very abruptly narrowed behind, the great reduction of the ligula and maxillæ in both sexes and the extremely slender curved front tibiæ of the female render *G. opacus* a rather isolated form.

26. **Gnaphaloryx opacus.** (Plate XV, figs. 11–13.)

Gnaphaloryx opacus Burm., Handb. Ent. v, 1847, p. 397; Arrow, Trans. R. Ent. Soc. Lond. lxxxiii, 1935, p. 113.
Gnaphaloryx taurus Voll., Tijds. Ent. viii, 1865, p. 154, pl. 2, figs. 3 & 4.
Gnaphaloryx burmeisteri Nagel, Ent. Mitth. xv, 1926, p. 120.
Gnaphaloryx taurus var. *andamanus* Kriesche, Arch. f. Nat. lxxxvi A, 1921, pt. 8, p. 100.

Black or earthy-brown, clothed with very minute yellowish setæ. Elongate and moderately convex, with fairly slender legs. The head smooth and opaque in front and strongly punctured behind. The pronotum strongly and densely punctured, except at the sides, which are rugose, and there is a broad slight depression in the middle, the front margin broad and trisinuate, the front angles produced and obliquely truncate, the lateral margins straight to the very strong and sharp lateral angles and strongly excised to the basal angles, which are also sharp, the base narrow and nearly straight. The scutellum strongly punctured. The elytra opaque, very densely and more or less confluently punctured, with the shoulders acute. The metasternum and abdomen opaque at the sides and shining in the middle, distinctly but not closely punctured.

♀. The anterior half of the *head* is entirely opaque and the posterior part rugosely punctured, the dividing line rather sharp. The front angles are obtuse, the post-ocular processes short. The mandibles are nearly straight, not broad at the base, with a large blunt internal tooth. The clypeal process is very narrow and prominent. The *elytra* less finely sculptured than those of the male and rather less opaque, rugose, usually with faint traces of three or four longitudinal costæ on each. The front *tibia* is very narrow, strongly curved outwards and produced at the end, with very minute lateral teeth and three apical processes, the two outer ones directed downwards. The middle and hind tibiæ have each a lateral spine.

♂. The *head* is short, broad and flat, the posterior punctured area very short. The ocular canthus is rather straight and angular and the post-ocular lobes are strong but very blunt. The mandibles are widely separated at the base, not very long, feebly curved externally, and generally bear three small teeth internally. The clypeal process is very short and broad, with the outer angles produced forward. The pronotum is dilated in front and the angles produced outwards, narrow behind, with very blunt angles. The *elytra* very finely and densely punctured. The front *tibia* is straight, the lateral teeth are minute and the prongs of the terminal fork strongly hooked. The middle tibia bears a minute lateral spine and the hind tibia has none.

Variation of the male. In small males the head is not very broad and the post-ocular process is feeble. The mandibles are scarcely as long as the head ; there is a small blunt tooth close to the base, another above and just beyond it and a third close to the tip. In larger specimens the head is broader, the post-ocular process more prominent but very blunt. The number of mandibular teeth remains constant, the second becoming only a little more prominent. Lengthening of the mandible usually occurs between the second and third teeth, so that in large examples there is a wide gap before the terminal fork ; but the lengthening may occur between the first and second teeth, the latter remaining close to the terminal fork. This seems to occur most commonly in the Andaman Islands and the name *andamanus* has been applied to the phase, although it is found in many other localities and perhaps wherever *G. opacus* is to be found.

♂. *Length* (with mandibles), 17–35 mm. ; (without mandibles) 16–28 mm. : *breadth*, 6·5–12·5 mm.

♀. *Length*, 18–27 mm. ; *breadth*, 7–12 mm.

ANDAMAN ISLANDS. NICOBAR ISLANDS. MALAY PENINSULA. TONKIN. PHILIPPINE ISLANDS. SUMATRA. JAVA. BORNEO. MOLUCCA IS.: Batchian, Waigeou.

Type probably in the Halle Museum.

Genus DORCUS.

Dorcus Macleay, Horæ Ent. 1819, p. 111 ; Lacordaire, Gen. Col. iii, 1856, p. 27 ; Arrow, Trans. R. Ent. Soc. Lond. lxxxiii, 1935, p. 109.

Lucanus subg. *Metopodontus* Hope & Westw., Cat. Luc. Col. 1845, pp. 4, 30. (Type, *saragei* Hope.)

Lucanus subg. *Prospocoilus*, id., *loc. cit.* (Type, *cavifrons* Westw.)

Lucanus subg. *Cyclophthalmus*, id., *op. cit.* p. 5. (Type, *platycephalus* Hope.)

Lucanus subg. *Macrognathus*, id., *op. cit.* pp. 5, 31. (Type, *giraffa* Oliv.)

Lucanus subg. *Platyprosopus*, id., *op. cit.* pp. 6, 31. (Type, *titanus* Boisd.)

Cladognathus Burm., Handb. Ent. v, 1847, p. 364 (new name for *Macrognathus* Hope & Westw.).
Prismognathus Motsch., Schrencks Reise, 1860, p. 138. (Type, *dauricus* Motsch.)
Psalidognathus, id., Etudes Ent. x, 1861, p. 15. (Type, *inclinatus* Motsch.)
Serrognathus, id., *loc. cit.* (Type, *titanus* Boisd.)
Macrodorcas, id., *loc. cit.* (Type, *rectus* Motsch.)
Psalidoremus, id., *op. cit.* xi, 1862, p. 55 (new name for *Psalidognathus*).
Cyclorasis Thoms., Ann. Soc. Ent. France (4), ii, 1862, p. 397 (new name for *Cyclophthalmus* Hope & Westw.).
Eurytrachelus, id., *op. cit.* p. 421. (Type, *tityus* Hope.)
Hemisodorcus, id., *loc. cit.* (Type, *nepalensis* Hope.)
Rhætus Parry, Trans. Ent. Soc. Lond. (3) ii, 1864, p. 10. (Type, *westwoodi* Parry.)
Ditomoderus, id., *op. cit.* p. 45. (Type, *mirabilis* Parry.)
Rhætulus Westw., Trans. Ent. Soc. Lond. 1871, p. 353. (Type, *crenatus* Westw.)
Metallactus Albers, Deutsche Ent. Zeitschr. 1884, p. 301. (Type, *parvulus* Hope & Westw.)
Metallactulus Rits., Notes Leyden Mus. vii, 1885, p. 54 (new name for *Metallactus* Albers).
Falcicornis Planet, Le Natural. xvi, 1894, p. 44. (Type, *groulti* Plan.)
Digonophorus Wat., Ann. Mag. Nat. Hist. (6) xvi, 1895, p. 157. (Type, *elegans* Parry.)
Metopodontus subg. *Hoplitocranum* Jakowl., Horæ Soc. Ent. Ross. xxx, 1896, p. 172. (Type, *jenkinsi* Westw.)
Gonometopus Houlb., Insecta, v, 1915, p. 19. (Type, *triapicalis* Houlb.)
Pelecognathus, id., *op. cit.* p. 52. (Type, *prosopocœloides* Houlb.)
Durelius, id., *op. cit.* p. 92. (Type, *derelictus* Parry.)
Tetrarthrius Did., Encycl. Ent., Col. ii, 1926, p. 28. (Type, *castaneus* Did.)
Eurytrachellelus [sic, not *-ellus*], Did., Col. Luc. du Globe, 1931, p. 185 (new name for *Eurytrachelus* Thoms, not Motsch.).

Type, *Scarabæus parallelipipedus* L.

Range. Almost world-wide.

Shape various, the two sexes generally differing greatly but sometimes, as in *D. cylindricus*, etc., very similar. Body generally almost without hair, except upon the legs and mouth, but occasionally (*D. velutinus*, *ursulus*) clothed with short setæ. Legs rather slender. Front coxæ well separated by the prosternum, which is sometimes broad and flat behind, sometimes elevated, compressed, pointed or produced. Front tibia rather irregularly toothed externally, the tip bifurcated in the male and generally in the female, but sometimes palmate in the latter (*i. e.* divided into three or four short lobes). Middle and hind tibiæ nearly always in the female (although not in *D. wimberleyi*) and frequently in the male, bearing a single sharp spine a little past the middle of the outer edge, never with more than one spine. Tarsi slender, with long claws and pulvillus. Antennæ 10-jointed, with 3-jointed club,

the seventh joint sometimes drawn out into a sharp supplementary process. Head in females (and occasionally in males) very short behind the eyes, so that the latter are close to the front angles of the prothorax, sometimes lengthened behind the eyes in the male, the posterior part then sometimes a little swollen behind the eyes or produced into a blunt or pointed process. Eye generally divided by the canthus in front, rarely (*D. rugosus*, etc.) almost completely divided, but the canthus never completely united with the cheek. Clypeal process various, generally tongue-like in the female, pointed, rectangular or cleft in the male. Maxilla long, the inner lobe bearing a horny hook in the female but not in the male. Mentum large and broad, naked, covering the ligula, which consists of two narrow rod-like diverging branches, bearing long hair-fringes anteriorly, the labial palpi with the first and third joints long and the second short.

This genus, protean in its outward aspect, at least in the male sex, but fairly homogeneous in its essential characters, is one of those aggregates which remain in nearly every large family of insects when the more circumscribed groups of species have been generically defined and separated. It has often happened that many of the individual forms composing such a mass of closely related species have, upon their first discovery, been considered generically distinct and given names accordingly but continual discovery of other forms filling the gaps in the series renders the subsequent abandonment of many such names inevitable. The striking nature of the features distinctive of many of the males in the present family has led to a particularly liberal creation of generic names based only upon those features, which, as a result of their invariable inconstancy, are usually wanting in small specimens of the male sex, as well as in all specimens of the other sex. For this reason, I have been obliged to treat as synonyms of *Dorcus* a considerable number of names hitherto accepted as valid. Attempts have been made by Thomson (Ann. Soc. Ent. France, 1862, p. 421) and by Gravely (Rec. Ind. Mus. xi, 1915, p. 407) to define certain of these according to the form of the prosternum or of the clypeal process, but the latter, in addition to being very inconstant, is of use only for the males and the study of many more species than were known to these authors has shown that both features are found in every stage of transition. Unwillingness to abandon names which are no longer useful often leads, as an alternative, to the introduction of still more names and consequently to ever increasing confusion.

It has not even been possible to retain the existing grouping for subdividing the genus *Dorcus*, the great differences generally found between the two sexes making features taken from the

males entirely inapplicable to the females. A more natural grouping is in my opinion to be obtained by employing the more constant characters of the female sex.

The study of such larvæ as are known has served to confirm the view I have expressed. Mr. J. C. Gardner (in 'Indian Forest Records,' vol. i, 1935, p. 7) writes—"The few identified larvæ belong to the genera *Dorcus*, *Hemisodorcus*, and *Prosopocœlus*; these, with an unknown species of *Eurytrachelus*, might all belong to one genus."

Key to the Species of Dorcus (males).

1	(96)	Lateral margin of the head without a sharp angle before the eye.	
2	(83)	Side of the head without a distinct post-ocular process.	
3	(72)	Pronotum narrower at the base than the elytra.	
4	(29)	Head very short; eyes near the front margin of pronotum.	
5	(28)	Lateral margins of the pronotum not pectinate.	
6	(25)	Elytra uniformly coloured.	
7	(16)	Head and pronotum smooth or very finely granular.	
8	(11)	Shoulders of the elytra sharply angular.	
9	(10)	Hind tibia bearing a lateral spine . . .	*antæus* Hope, p. 86.
10	(9)	Hind tibia without a lateral spine . .	*curvidens* Hope, p. 88.
11	(8)	Shoulders of the elytra not sharp.	
12	(13)	Elytra shining	*derelictus* Parry, p. 91.
13	(12)	Elytra dull.	[p. 92.
14	(15)	Lateral angle of the pronotum blunt.	*opacipennis* Zang,
15	(14)	Lateral angle of the pronotum acute	[p. 93. *ratiocinativus* Westw.,
16	(7)	Head and pronotum rugose or strongly punctured.	
17	(20)	Shoulders of the elytra rounded.	
18	(19)	Basal part of the elytra bearing continuous rows of setæ	[p. 94. *velutinus* Thoms.,
19	(18)	Basal part of the elytra bearing interrupted rows of setæ	*ursulus* Arrow, p. 95.
20	(17)	Shoulders of the elytra sharply angular.	
21	(22)	Pronotum without sharp lateral angle	[p. 96. *cylindricus* Thoms.,
22	(21)	Pronotum with sharp lateral angle.	[p. 98.
23	(24)	Elytra moderately long	*immundus* Arrow,
24	(23)	Elytra very short and broad	*rugosus* Boil., p. 99.
25	(6)	Elytra very glossy, decorated with pale markings.	
26	(27)	Pronotum spotted, its sides rounded in front	[p. 100. *fulvonotatus* Parry.
27	(26)	Pronotum not spotted, its sides not rounded in front	[p. 101. *bisignatus* Parry,
28	(5)	Lateral margins of the pronotum pectinate	*boileaui* Did., p. 103.

29 (4) Head not very short, eyes far from front margin of the pronotum.
30 (39) Body broad and flat.
31 (38) Clypeal process broad and conspicuous.
32 (33) 7th joint of the antenna as long as the 8th .... *titanus* Boisd., p. 104.
33 (32) 7th joint of the antenna not as long as the 8th.
34 (37) Mandible with small teeth only or none.
35 (36) Mandibles much longer than the head, except in small specimens with closely sulcate elytra ...... *tityus* Hope, p. 106.
36 (35) Mandibles not much longer than the head ; elytra never closely sulcate *submolaris* H. & W., [p. 108.
37 (34) Mandible bearing a single strong tooth close to the base in small specimens, advanced and double in larger ones................. *reichei* Hope, p. 109.
38 (31) Clypeal process invisible from above. *hyperion* Boil., p. 112.
39 (30) Body convex, not very broad.
40 (69) Prothorax not abruptly narrowed in front.
41 (66) Upper surface dark.
42 (55) Body not narrow, legs not very slender.
43 (44) Clypeal process short and broad ... *sewertzowi* Sem., [p. 113.
44 (43) Clypeal process minute.
45 (52) Clypeal process single.
46 (51) Lateral margin of the pronotum finely serrate, lateral angle spiniform.
47 (48) Eyes not very small, head not narrowed behind .... *curvipes* H. & W., [p. 116.
48 (47) Eyes very small, head narrowed behind.
49 (50) Eyes almost completely divided, lateral margin of pronotum deeply excised behind, submentum not lobed .... *spencei* Hope, p. 117.
50 (49) Eyes less divided, lateral margin of pronotum feebly excised behind, submentum lobed (except in small specimens).................... *bulbosus* Hope, p. 118.
51 (46) Lateral margin of the pronotum not serrate, lateral angle not spiniform *perplexus* Parry, p. 120.
52 (45) Clypeal process double.
53 (54) Sides of the pronotum not punctured .... *polymorphus*, n. n., [p. 121.
54 (53) Sides of the pronotum coarsely punctured .... *dentifer* Deyr., p. 122.
55 (42) Body narrow, legs very slender.
56 (61) Sides of the pronotum straight and parallel.
57 (58) Hind tibia tufted at the end ...... *jenkinsi* Westw., [p. 124.
58 (57) Hind tibia not tufted at the end.
59 (60) Last sternite bearing a tufted process .... *macclellandi* Hope, [p. 125.

60	(59)	Last sternite setose	*passaloides* H & W., [p. 127.
61	(56)	Sides of the pronotum rounded.	
62	(63)	Tarsi not very hairy; base of the pronotum very narrow	*boreli* Boil., p. 128.
63	(62)	Tarsi very hairy; base of the pronotum not very narrow.	
64	(65)	Sides of the pronotum strongly rounded	*feai* Boil., p. 129.
65	(64)	Sides of the pronotum feebly rounded	*cilipes* Thoms., p. 130.
66	(41)	Elytra pale, with dark sutural stripe.	
67	(68)	Lateral margin of the pronotum strongly angulate	*histrio* Arrow, p. 131.
68	(67)	Lateral margin of the pronotum feebly angulate................	*speciosus* Boil., p. 133.
69	(40)	Prothorax narrow, abruptly contracted in front.	
70	(71)	Colour dark reddish brown or almost black	*prosopocœloides* Houlb., [p. 134.
71	(70)	Colour red......................	*elegans* Parry, p. 135.
72	(3)	Pronotum broader at the base than the elytra.	
73	(76)	Elytra not glossy.	
74	(75)	Colour pale	*suturalis* Oliv., p. 136.
75	(74)	Colour very dark	*nageli* Arrow, p. 137.
76	(73)	Elytra glossy.	
77	(80)	Hind angles of the pronotum completely rounded.	
78	(79)	Elytra long and narrow	*vernicatus* Arrow, [p. 138.
79	(78)	Elytra rather short	*humilis* Arrow, p. 140.
80	(77)	Hind angles of the pronotum not completely rounded.	
81	(82)	Elytra very smooth	*buddha* Hope, p. 141.
82	(81)	Elytra with double rows of punctures	*groulti* Plan., p. 142.
83	(2)	Side of the head with a distinct post-ocular process.	
84	(89)	Post-ocular process not pointed.	
85	(88)	Elytra shining, striped; middle tibia notched.	
86	(87)	Pronotum black and red	*biplagiatus* Westw., [p. 143.
87	(86)	Pronotum entirely black..........	*inquinatus* Westw., [p. 145.
88	(85)	Elytra dull, black; middle tibia not notched	*candezei* Boil., p. 146.
89	(84)	Post-ocular process pointed.	
90	(93)	Elytra distinctly punctured.	
91	(92)	Bright yellow	*occipitalis* H. & W., [p. 147.
92	(91)	Black	*henryi* Arrow, p. 149.
93	(90)	Elytra not distinctly punctured.	
94	(95)	Pronotum dilated in front	*pascoei* Boil., p. 150.
95	(94)	Pronotum not dilated in front.....	*oweni* H. & W., p. 151.
96	(1)	Lateral margin of the head with a sharp angle before the eye.	
97	(112)	Eyes not very prominent laterally.	
98	(101)	Side of the head with a post-ocular process.	
99	(100)	Post-ocular process long and pointed	*wimberleyi* Parry, [p. 153.
100	(99)	Post-ocular process very short and blunt	*giraffa* Oliv., p. 154.
101	(98)	Side of the head without a post-ocular process.	

102	(103)	Pronotum without a sharp lateral tooth behind the middle	*politus* Parry, p. 156.
103	(102)	Pronotum with a sharp lateral tooth behind the middle.	
104	(109)	Elytra partly or entirely reddish.	
105	(108)	Pronotum not very short and broad.	
106	(107)	Hind angles of pronotum well marked	*arrowi* Boil., p. 158.
107	(106)	Hind angles of the pronotum not well marked	*macleayi* H. & W., [p. 158.
108	(105)	Pronotum very short and broad ...	*donckieri* Boil., p. 160.
109	(104)	Entirely black above.	
110	(111)	Sides of the pronotum nearly straight in front	*nepalensis* Hope, p. 161.
111	(110)	Sides of the pronotum rounded in front..........................	*wardi* Arrow, p. 162.
112	(97)	Eyes very prominent laterally.	
113	(116)	Anterior half of eye divided.	
114	(115)	Wholly black	*westwoodi* Parry, p. 163.
115	(114)	Wholly reddish..................	*foveatus* Hope, p. 165.
116	(113)	Eyes not divided in front.	
117	(118)	Hind angles of the pronotum very sharp	*castaneicolor*, n. n., [p. 167.
118	(117)	Hind angles of the pronotum not very sharp.	
119	(122)	Reddish or yellowish.	
120	(121)	Sides of the head swollen behind the eyes	*subnitens* Parry, [p. 168.
121	(120)	Sides of the head not prominent behind the eyes	*lucidus* Boil., p. 170.
122	(119)	Colour black	*platycephalus* Hope, [p. 171.

The males of the following species are unknown and therefore cannot be included in the above table :—

Dorcus rudis Westw., *laterotarsus* Houlb., *pouillaudei* Houlb.

Key to the Species (females).

1	(40)	Head bearing a median tubercle or two tubercles placed transversely.	
2	(37)	Head bearing two tubercles.	
3	(32)	Upper surface without erect setæ.	
4	(29)	Upper surface dark, without yellow ornamentation.	
5	(28)	Cephalic tubercles small, not sharp.	
6	(21)	Forehead coarsely rugose.	
7	(8)	Elytra smooth, scarcely punctured, dull..........................	*antæus* Hope, p. 86.
8	(7)	Elytra not smooth.	
9	(10)	Elytra closely punctured	*titanus* Boisd., p. 104.
10	(9)	Elytra grooved.	
11	(14)	Front tibia not broad.	
12	(13)	Sides of the pronotum not excised behind	*curvidens* Hope, p. 88.
13	(12)	Sides of the pronotum excised behind	*rudis* Westw., p. 90.
14	(11)	Front tibia broad.	

15	(16)	Sides of the pronotum narrowly punctured : middle of the metasternum smooth	*hyperion* Boil., p. 112.
16	(15)	Sides of the pronotum broadly punctured : middle of the metasternum punctured.	
17	(20)	Elytra each with one smooth interval adjoining the suture.	
18	(19)	Pronotum smooth in the middle...	*reichei* Hope, p. 109.
19	(18)	Pronotum with a double series of punctures in the middle	*tityus* Hope, p. 106.
20	(17)	Elytra each with two smooth intervals adjoining the suture ...	*submolaris* H. & W., [p. 108.
21	(6)	Forehead not coarsely rugose.	
22	(23)	Lateral angle of pronotum very blunt	*donckieri* Boil., p. 160.
23	(22)	Lateral angle of pronotum sharp.	
24	(25)	Pronotum not strongly transverse. .	*macleayi* H. & W., [p. 158.
25	(24)	Pronotum strongly transverse.	
26	(27)	Lateral angle of pronotum produced	*ratiocinativus* Westw., [p. 93.
27	(26)	Lateral angle of pronotum not produced	*wardi* Arrow, p. 162.
28	(5)	Cephalic tubercles strong and sharp.	*derelictus* Parry, p. 91.
29	(4)	Upper surface with yellow ornamentation.	
30	(31)	Pronotum without lateral angle ...	*fulvonotatus* Parry, [p. 100.
31	(30)	Pronotum with lateral angle . .	*bisignatus* Parry, [p. 101.
32	(3)	Upper surface bearing short erect setæ.	
33	(36)	Shoulders of the elytra rounded.	
34	(35)	Elytral setæ forming tufts in the anterior part	*ursulus* Arrow, p. 95.
35	(34)	Elytral setæ forming continuous rows	*velutinus* Thoms., p. 94.
36	(33)	Shoulders of the elytra sharp......	*cylindricus* Thoms., [p. 96.
37	(2)	Head bearing a single median tubercle.	
38	(39)	Forehead rugose : head not angular in front of the eye	*opacipennis* Zang, [p. 92.
39	(38)	Forehead not rugose : head angular in front of the eye	*nepalensis* Hope, p. 161.
40	(1)	Head without one or two tubercles.	
41	(102)	Mandibles not bifurcate.	
42	(43)	Head smooth	*westwoodi* Parry, [p. 163.
43	(42)	Head strongly punctured or rugose.	
44	(65)	Front tibia with distinct terminal fork.	
45	(62)	Front tibia stout.	
46	(59)	Upper surface not entirely dull and rugose.	
47	(58)	Hind angle of the pronotum blunt or rounded.	
48	(49)	Elytra very smooth and shining except at sides	*boileaui* Did., p. 103.
49	(48)	Elytra not smooth and shining.	
50	(51)	Elytra strongly grooved dorsally . .	*passaloides* H. & W., [p. 127.
51	(50)	Elytra finely punctured dorsally.	
52	(55)	Elytra not densely punctured dorsally.	

53	(54)	Pronotum quite smooth in the middle	*feai* Boil., p. 129.
54	(53)	Pronotum finely punctured in the middle	*cilipes* Thoms., p. 130.
55	(52)	Elytra densely punctured dorsally.	
56	(57)	Sides of the pronotum coarsely punctured	*bulbosus* Hope, p. 118.
57	(56)	Sides of the pronotum rugose......	*polymorphus*, n. n., [p. 121.
58	(47)	Hind angle of the pronotum sharp. .	*sewertzowi* Sem., [p. 113.
59	(46)	Upper surface entirely dull and rugose.	
60	(61)	Elytra not very short	*immundus* Arrow, [p. 98.
61	(60)	Elytra very short................	*rugosus* Boil., p. 99.
62	(45)	Front tibia slender.	
63	(64)	Elytra not shining	*dentifer* Deyr., p. 122.
64	(63)	Elytra smooth and shining	*humilis* Arrow, p. 140.
65	(44)	Front tibia ending in three or more short lobes.	
66	(67)	Upper surface rugosely punctured, dull.........................	*candezei* Boil., p. 146.
67	(66)	Upper surface partly or entirely shining.	
68	(81)	Upper surface decorated with spots or stripes.	
69	(72)	Elytra yellow, with black sutural stripe.	
70	(71)	Pronotum yellow, with three black spots	*occipitalis* H. & W., [p. 147.
71	(70)	Pronotum yellow, with black median stripe	*suturalis* Oliv., p. 136.
72	(69)	Elytra black, with orange bands.	
73	(80)	Front tibia straight.	
74	(75)	Pronotum with blunt hind angles. .	*histrio* Arrow, p. 131.
75	(74)	Pronotum without hind angles.	
76	(77)	Elytra rather long	*speciosus* Boil., p. 133.
77	(76)	Elytra short and broad.	
78	(79)	Pronotum entirely black	*inquinatus* Westw., [p. 145.
79	(78)	Pronotum with two orange bands. .	*biplagiatus* Westw., [p. 143.
80	(73)	Front tibia curved	*wimberleyi* Parry, [p. 153.
81	(68)	Upper surface not decorated with spots or stripes.	
82	(95)	Upper surface entirely black.	
83	(88)	Front tibia straight.	
84	(87)	Head with lateral process behind the eye.	
85	(86)	Lateral process of head blunt	*pascoei* Boil., p. 150.
86	(85)	Lateral process of head sharp	*oweni* H. & W., p. 151.
87	(84)	Head without lateral process......	*giraffa* Oliv., p. 154.
88	(83)	Front tibia curved.	
89	(90)	Pronotum strongly and closely punctured	*pouillaudei* Houlb., [p. 114.
90	(89)	Pronotum shining in the middle.	
91	(92)	Elytra sharply divided into shining (inner) and dull (outer) halves. . .	*laterotarsus* Houlb., [p. 115.
92	(91)	Elytra not sharply divided.	
93	(94)	Pronotum with sharp lateral angle. .	*curvipes* H. & W., [p. 116.
94	(93)	Pronotum without sharp lateral angle	*buddha* Hope, p. 141.

95	(82)	Upper surface not entirely black.	
96	(97)	Front tibia straight	*foveatus* Hope, p. 165.
97	(96)	Front tibia curved.	
98	(99)	Body rather short	*politus* Parry, p. 156.
99	(98)	Body rather long.	
100	(101)	Hind angles of pronotum obtuse...	*jenkinsi* Westw., p. 124.
101	(100)	Hind angles of pronotum wanting..	*macclellandi* Hope,
102	(41)	Mandibles compressed and bifurcate.	[p. 125.
103	(108)	Pronotum with lateral angle	[p. 171.
104	(105)	Body black	*platycephalus* Hope,
105	(104)	Body brown or yellow.	
106	(107)	Pronotum entirely shining	*subnitens* Parry, p. 168.
107	(106)	Pronotum dull at the sides	*lucidus* Boil., p. 170.
108	(103)	Pronotum without lateral angle.	
109	(110)	Upper surface black	*humilis* Arrow, p. 140.
110	(109)	Upper surface dark red	*groulti* Plan., p. 142.

The females of the following species are unknown to me :—

Dorcus elegans Parry, *groulti* Planet, *perplexus* Parry, *arrowi* Boil., *boreli* Boil., *castaneicolor* Arrow, *henryi* Arrow, *nageli* Arrow, *vernicatus* Arrow, *spencei* Hope, and *prosopocœloides* Houlb.

27. **Dorcus antæus.** (Plate VII, figs. 5, 6.)

Dorcus antæus Hope,* Proc. Ent. Soc. Lond. 1842, p. 83 ; Hope & Westw., Cat. Luc. Col. 1845, p. 20 ; Arrow, Ann. Mag. Nat. Hist. (11) ii, 1938, p. 53 ; Did., Luc. du Globe, 1928, p. 47, figs. 14–19.
♀. *Lucanus scaritides* Hope & Westw.,* Cat. Luc. Col. 1845, p. 24.
Rhætus parryi Boil., Mem. Soc. Ent. Belg. ix, 1902, p. 49, pl. 2, fig. 2.
Dorcus yaksha Gravely,* Rec. Ind. Mus. xi, 1915, p. 422, pl. 29, fig. 1.

Entirely jet-black, very smooth but not very shining, the form not very convex, the legs rather stout. The eyes very small, the canthus extending to the middle of the eye and not laterally prominent. The prosternum broad and flat between and behind the coxæ, gently rounded and scarcely elevated behind.

♀. The *head* is coarsely rugose and has a pair of small tubercles in the middle, the clypeal process is prominent and feebly bilobed. The *pronotum* is rather dull, with the sides narrowly rugose, the lateral edges gently rounded and very feebly angulate behind the middle. The *elytra* are also rather dull, with the sides rugosely punctured. The *metasternum* is smooth and shining in the middle and rugose at the sides. The sides of the *abdomen* are rugosely punctured and the terminal sternite closely punctured. The front *tibia* is forked at the end.

♂. Rather broad and depressed. The *head* is broad and opaque, the mandibles rather short, far apart at the base, the clypeal process extremely short and broad, with the front

angles feebly produced outwards. There is a minute angulation of the side of the head behind the eye. The upper surface is not toothed behind the base of the mandible. The *pronotum* is short and broad, microscopically granular, feebly shining in the middle, the lateral margin of variable form and the hind angle well marked but not very sharp. The *scutellum* is finely punctured, with the apex smooth. The *elytra* are very smooth, lightly coriaceous, almost unpunctured, with the shoulders angular but not acute. The lower surface is smooth but the sides of the *metasternum* are densely rugose. The terminal fork of the front *tibia* is short and strongly bent downward, and the middle and hind tibiæ have each a lateral spine.

Variation of the male. Very small specimens (*Rhætus parryi* Boil.) are relatively narrow in shape and have the mandibles simple, narrow and strongly curved, the lateral margins of the pronotum gently rounded and the sides of the elytra rugosely punctured. Rather larger males show a blunt angulation near the base of the mandible internally, which at a further stage becomes a sharp triangular tooth (*D. yaksha* Grvl.). With increasing size and lengthening mandibles the relative width of the body increases and the curvature of the sides of the prothorax is interrupted by an indentation in front, while the roughness of the sides of the elytra gradually disappears. In moderately large specimens the mandible bears a very stout horizontal tooth, which has advanced towards the middle, the indentation of the thoracic margin forms a prominent angle behind it and the elytra are broad and very smooth. Very large males have the mandibular tooth beyond the middle and directed obliquely forward and the lateral angulation of the prothorax is near the middle of the side margin. The prominence of the angles of the clypeal process increases with the size of the specimens.

♂. *Length* (with mandibles), 26–70 mm.; (without mandibles) 24–50 mm.: *breadth*, 10–28 mm.

♀. *Length*, 27–42 mm.; *breadth*, 11–17 mm.

United Prov.: Naini Tal (*D. Owen*); Kumaun, W. Almora (*H. G. Champion*). Darjeeling Distr.: Pedong (*L. Durel*); St. Mary's Forest, Kurseong (*R. P. Wery*; *E. A. D'Abreu*, June). Assam: Cherrapunji. Burma: Ruby Mines (*W. Doherty*). Siam.

Type in the Hope Dept., Oxford University Museum, also that of *L. scaritides*; that of *Rhætus parryi* Boil. in the Paris Museum and that of *D. yaksha* Gravely in the Indian Museum, Calcutta.

28. **Dorcus curvidens.** (Plate VII, fig. 7.)

Lucanus curvidens Hope,* Trans. Linn. Soc. Lond. xviii, 1841, p. 589; Hope & Westw., Cat. Luc. Col. 1845, p. 22.
Dorcas dehaani Hope,* Trans. Linn. Soc. Lond. xix, 1845, p. 106.
Lucanus dehaani Hope & Westw., Cat. Luc. Col. 1845, p. 22.
Dorcus curvidens Boil., Trans. Ent. Soc. Lond. 1913, p. 253.

Entirely black, rather massive, with stout legs. The eyes are almost divided by the canthus, which does not project laterally. The prosternum broad behind, scarcely elevated, slightly convex.

♀. Oval, slightly convex. The *head* is coarsely rugose, with a pair of small tubercles close together in the middle. The mandibles are narrow and bear a small internal tooth above and another beneath. The clypeal process is feebly bilobed. The *pronotum* is very smooth and shining, with the sides and a narrow basal margin coarsely and rugosely punctured. The sides are rounded, very gently in front and strongly behind, without lateral or basal angulation. The *scutellum* is strongly punctured. The *elytra* have a smooth shining sutural margin, followed by a broad, very strongly punctured interval and a series of narrow shining costæ, separated by rugose intervals, the costæ becoming gradually feebler towards the sides, which are rugose, as well as the apices. The *metasternum* is smooth and shining in the middle, coarsely rugose at the sides. The *abdomen* is finely punctured in the middle and coarsely and rugosely at the sides. The front *tibia* has fine lateral teeth and three short terminal lobes.

♂. Broad and more or less depressed. The *head* is short and opaque and bears a tooth on each side just beyond the front margin and near the base of the mandible. The mandibles are far apart at the base and the clypeal process is very short and broad, its front margin very gently curved and the angles feebly produced. There is a very small quadrate projection on each side behind the eye. The *pronotum* is short and broad, with flattened lateral margins, and generally microscopically granular and opaque. The *elytra* are smooth and shining in large specimens, punctate-striate or broadly sulcate in small ones, but always with the sides rugose and opaque, the lateral margins rounded and the shoulders acutely pointed. The terminal fork of the front *tibia* is strongly and rather abruptly bent downwards, the middle tibia bears a small lateral spine and the hind tibia has none.

Variation of the male. The transformation in the appearance which accompanies variation in size is almost complete and the size attained by the male is very great compared with that of the female. Small males rather closely resemble females, except in the broader and smoother head, with its sharp tooth on each side near the front margin and the very

wide clypeal process. In such specimens the head is rather closely punctured, opaque only in front and shining behind. The pronotum is rather rectangular, smooth and shining, with minute punctures, except at the sides and close to the hind margin, where it is rather coarsely rugose. The lateral margins are almost straight and parallel, the front angles very blunt, the lateral angles feebly indicated and the hind angles obsolete. The elytra have a smooth sutural margin and numerous narrow shining costæ, separated by rugose intervals, the costæ becoming gradually feebler towards the sides, which are broadly rugose. The mandibles are very short, very strongly curved, with a strong triangular tooth close to the base and pointing a little backward. Less dwarfed examples have the mandibles longer, the head more opaque, the sides of the pronotum less parallel and more distinctly angulate behind, the elytra irregularly striate, with the intervals flat and, in the posterior part, broad and closely punctured. At a further stage the head and pronotum are minutely granular and opaque, without punctures, the latter is broader in front and a slight excision of the lateral margin appears near the front. The elytral striæ, though strong near the rugose sides, become feeble in the inner part, where the close punctures also are finer. Punctures and striæ finally disappear, except close to the base, the elytra becoming relatively shorter and broader. At this stage the lateral excision of the pronotum is deep and there is a strong angulation of the margin behind it, the mandibles have increased in length, they are less evenly rounded externally and the tooth is farther from the base. In large specimens the mandibles are almost straight in the middle part, slightly barbed near the tip, and the strong tooth is situated past the middle and directed obliquely forward. The elytra are smooth and shining, with the base and sides rugose.

♂. *Length* (with mandibles), 38–73 mm.; (without mandibles) 33–54 mm.: *breadth*, 15–28 mm.

♀. *Length*, 32–40 mm.; *breadth*, 13–19 mm.

BHUTAN (*Capt. Pemberton*). DARJEELING DISTR.: Kurseong, 6000 ft (*E. A. D'Abreu*, June, July); Gopaldhara, Rungbong Valley (*W. K. Webb*); Pedong (*L. Durel*). SUMATRA. JAVA.

Type in the Hope Dept., Oxford University Museum.

D. curvidens is very closely related to *D. hopei* Saund., of China and Japan, the average size of which is a little smaller. The males, although that of *hopei* is rather shining, can only be distinguished with a little difficulty, but the female of *D. hopei* is easily recognizable, being without the deeply grooved elytra of *D. curvidens*.

It seems to me probable that Hope described the same specimen first as *curvidens* and four years later as *dehaani*.

Both his descriptions apply to a specimen in the Hope collection, except that the length is given as 21 lines (breadth $6\frac{1}{2}$ lines) in the first and 22 lines (breadth $7\frac{1}{4}$ lines) in the second. Hope's label records "curvidens, Hope. Assam. S. Jones," but the measurement he gives for *dehaani* fits the specimen more exactly than that given for *curvidens*. In the 'Catalogue of Lucanoid Coleoptera,' Westwood has reproduced the (inaccurate) measurements given for *curvidens* but he described another and smaller specimen, only 17 lines long, as *dehaani*. The elytra, described as smooth in the original type, are striate in Westwood's specimen. Hope's red label, bearing the name *dehaani*, has been placed by mistake upon a female specimen and this apparently deceived both Westwood and Boileau. The latter referred to this female as the type of the species, but Hope knew only the male. The specimens all belong to the same species.

29. **Dorcus rudis.** (Plate XII, fig. 20.)

Cladognathus rudis Westw.,* Trans. Ent. Soc. 1864, p. 35, pl. 9, fig. 5.
Dorcus rudis Boil., T.E.S. 1913, p. 254.
Prosopocœlus sulcatipennis Houlb.,* Insecta, v, 1915, p. 51.

♀. Black, shining, with the lower surface deep red. Rather narrowly elongate, convex, with slender legs. The *head* is closely rugose, with a pair of minute tubercles placed transversely between the eyes. The canthus is narrow, extending beyond the middle of the eye, and not prominent at the end. The *pronotum* has a very irregular double series of punctures along the middle line and the sides are very broadly and closely punctured. The short interval between the median and lateral groups of punctures bears very fine scattered punctures. The lateral margins are gently rounded to well beyond the middle, where they are rather sharply angulate, and from there strongly excised to the strongly marked hind angles. The *elytra* have each five shining costæ, placed wide apart, and diminishing in width outwards from the sutural one, which alone extends to the apex. The fourth costa arises at the shoulder. The space between the first and second costæ is deeply striate, leaving two narrow, shining intervals. The remaining interspaces are less deeply striate and the intervals are rugose. The apices are very finely and closely rugose. The *mentum* is coarsely rugose. The *prosternum* is narrowly compressed and rather sharply produced behind. The sides of the metasternum are rugosely punctured and clothed with fine yellow hair. The *abdomen* bears scattered punctures, except upon the last sternite, which is closely punctured. The front *tibia* is rather narrow, sharply forked at the end, and has three sharp lateral teeth.

♂. Unknown.

Length, 18 mm.; *breadth*, 7·5 mm.

Bhutan (*L. Durel*). Bengal: Kurseong (Brussels Museum).

Type in the British Museum; that of *sulcatipennis* in the Oberthur collection.

30. **Dorcus derelictus.** (Plate IX, figs. 3, 4.)

Dorcus derelictus Parry,* Proc. Ent. Soc. Lond. 1863, p. 112; Trans. Ent. Soc. Lond. 1864, p. 50; *op. cit.* 1870, p. 92, pl. 2, fig. 3; Boil., *op. cit.* 1913, p. 254.
Durelius derelictus Houlb., Insecta, v, 1915, p. 92.

Black, smooth and shining in both sexes, with the head opaque. Rather elongate, with fairly slender legs and short mandibles in both sexes, which are similar, but the female with a pair of strong sharp tubercles upon the head, the male with the pronotum sharply angulate at the side and contracted behind. The head broad in front, contracted behind the eyes, which are very small. The pronotum smooth and shining in the middle, coriaceous and dull at the sides. The front margin rather prominent in the middle, the front angles blunt, the sides gently rounded to the lateral angle and almost straight to the base. The elytra densely punctured at the sides with a shallow longitudinal depression behind each shoulder, the shoulders not sharply angular. The lower surface rather shining. The prosternum elevated behind but scarcely compressed or pointed. Only the middle tibia bears a lateral spine.

♀. The *head* is closely rugose except in the posterior part and the anterior part is a little hollowed. A pair of sharp tubercles placed at the hind margin of the hollowed part project forward a little. The mandibles are narrow, very acute, uniformly rounded externally and have a rather sharp internal tooth. The *pronotum* is broad and very shining, except at the sides. The *elytra* are very shining upon the inner half and densely punctured and opaque upon the outer half and at the end. The front *tibia* is slender, finely toothed laterally, curving slightly outwards at the tip and terminating in four lobes, two short ones above and two longer ones beneath.

♂. The *head* is closely granular, the front angles are very obtuse and the canthus extends past the middle of the eye. The mandibles are very little longer than those of the female, less rounded externally, abruptly dilated internally just beyond the base, serrate at the inner edge and acutely produced at the tip. The *pronotum* is not broad and is rather narrow at the base. The *elytra* are minutely granular, sparsely upon the inner part and closely at the sides, where, however, they are not opaque. The *legs* and antennæ are a little longer

than those of the female, the terminal fork of the front tibia is short and abrupt and the tarsi bear rather long yellow hairs beneath.

No variation of importance is at present known.

♂. *Length* (with mandibles), 30–34 mm.; (without mandibles) 27–31 mm.: *breadth*, 12–13 mm.

♀. *Length*, 32–36 mm.; *breadth*, 13–14 mm.

DARJEELING DISTR.: Pedong (*L. Durel*).

Type in the British Museum.

The very feeble sexual dimorphism of this species is remarkable in an insect of fairly large size. It is noteworthy that there is at the same time an accentuation of the female characteristic in the tubercles upon the head. The form of the male mandibles seems to suggest that they may be employed for some practical purpose.

The type of *D. derelictus* is a female and the male was for many years unknown, perhaps because it was regarded as belonging to the other sex.

31. **Dorcus opacipennis.** (Plate IX, figs. 10, 11.)

Dorcus opacipennis Zang,* Deutsche Ent. Zeits. 1906, p. 184; Arrow, Trans. R. Ent. Soc. Lond. lxxxiii, 1935, p. 109; Ann. Mag. Nat. Hist. (11) ii, 1938, p. 53.
D. suturalis Westw.,* Trans. Ent. Soc. Lond. 1871, p. 358, pl. 8, fig. 5; Wat., Ann. Mag. Nat. Hist. (5) xix, 1887, p. 289; Boil., Trans. Ent. Soc. Lond. 1913, p. 253.
D. rotundopunctatus Nagel,* Arb. Morph. Tax. Ent. iii, 1936, p. 209.

Black and opaque, the pronotum and a triangular basal area common to both elytra shining in the female. Moderately elongate, rather parallel-sided, with fairly stout legs, the middle and hind tibiæ each armed with a lateral spine. The canthus produced beyond the middle of the eye. The antennæ short, the joints of the club short and the seventh joint sharply produced. The shoulders of the elytra rounded. The prosternum broad and rounded behind.

♀. The *head* is coarsely rugose, with a strong median tubercle between the eyes, the canthus rounded and slightly prominent in front. The mandibles are short, with a sharp internal tooth and a blunt one directed upwards. The clypeal process is feebly bilobed. The *pronotum* very smooth and shining, but the sides rather narrowly opaque and densely punctured. The front angles are very bluntly produced, the lateral margins first a little sinuate, then straight to the lateral angle, which is obtuse, and then straight again to the base. The *elytra* are very closely punctured and opaque, with the exception of a triangular basal area not extending to the shoulders nor to the ends of the elytra: this area is very shining and very minutely but not closely punctured. The front *tibia* is fairly strongly toothed laterally and forked at the end.

♂. The *body* is a little depressed. The *head* is short and broad, densely microscopically granular, the clypeal process very short and broad, with straight front margin. The mandibles are strongly rounded, far apart at the base and rather short. The canthus is obtusely angular in front of the eye and the sides are contracted behind the eye. The *pronotum* is short and broad, microscopically granular, the front angles are rounded, the sides strongly sinuate in front, straight behind and the lateral angle obtuse. The *scutellum* is slightly shining. The *elytra* are very opaque, with a feebly shining sutural area, which dilates a little at the base and is finely punctured. The *mentum* is rugose. The *metasternum* is smooth and shining in the middle, densely granular at the sides, where there is a thin clothing of fine hair. The *abdomen* is opaque beneath, with the sides slightly rugose and the last sternite finely punctured.

Variation of the male. In small specimens the short, strongly curved mandibles are quite simple in shape, but have a slight blunt internal tooth upon the upper edge near the base. With increasing size this tooth becomes stronger, forming an acutely pointed triangle, and is situated farther from the base. In the largest male I have seen it occupies the middle of the mandible, which is about twice as long as the head.

♂. *Length* (with mandibles), 30–46 mm.; (without mandibles) 27–32 mm.: *breadth*, 11–14 mm.

♀. *Length*, 30–36 mm.; *breadth*, 12–15·5 mm.

KASHMIR: Gulmarg, 9000 ft. (*C. F. C. Beeson*, July); Sonamarg (*T. R. D. Bell*). PUNJAB: Thobba, Murree Hills (*Major Howland Roberts*).

Type in the Berlin Entom. Institute, also that of *rotundopunctatus*; that of *suturalis* in the British Museum.

I am indebted to Dr. Walther Horn for enabling me to examine the two types in the Berlin collection.

The oldest name of this species, that given by Westwood, cannot be adopted on account of the existence in the genus of an earlier described species of the same name.

32. **Dorcus ratiocinativus.** (Plate IX, fig. 12.)

Dorcus ratiocinativus Westw.,* Trans. Ent. Soc. Lond. 1871, p. 356, pl. 8, fig. 2; Boil., Mem. Soc. Ent. Belg. ix, 1902, p. 59, pl. 1, figs. 2 & 3; Trans. Ent. Soc. Lond. 1913, p. 253.

Dark chocolate-red, with the head, legs and lower surface black, the surface dull, except upon the inner anterior part of the elytra. Narrowly elongate, moderately convex, with rather short antennæ and legs. The front angles of the head very obtuse, the eyes small, the canthus extending past the middle of the eye and the sides feebly prominent behind the

eye. The pronotum smooth, its lateral margin gently rounded to the acute lateral angle and concave to the very obtuse hind angle, the base gently rounded. The scutellum smooth or punctured. The elytra very finely and closely punctured, except close to the suture, where the punctures are very sparse and minute, the shoulders rounded. The prosternum rounded behind, not compressed nor pointed. The three lamellæ of the antennal club short and the seventh joint little produced. The front tibia is forked at the end in both sexes and the middle and hind tibiæ have each a strong lateral spine.

♀. The *head* is roughly and irregularly punctured and bears a pair of tubercles placed close together in the middle. The clypeal process is feebly bilobed and not broad. The *pronotum* has a few scattered punctures at the sides. The last ventral *sternite* is finely and closely punctured.

♂. The *head* is flat, smooth and very opaque, the mandibles short, very strongly rounded and far apart at the base. The clypeal process is short and broad, with the front edge straight and fringed with yellow setæ. The mandibles are flat at the base, where they are a little dilated externally, and bear a sharp internal tooth, directed slightly backwards. The *pronotum* is minutely coriaceous, without visible puncturation, and the front angles are obliquely truncate. The lower surface is very smooth.

Variation of the male. There is very little variation. In small examples, where the mandibles are scarcely as long as the head, the tooth is not far removed from the base. In large ones the mandibles are a little longer than the head and the tooth approaches the middle of their length.

♂. *Length* (with mandibles), 27–30 mm.; (without mandibles) 23–25 mm.: *breadth*, 9·5–10·5 mm.

♀. *Length*, 27–28 mm.; *breadth*, 11–12 mm.

SIKKIM: between Padamtsin and Lingtou (July). TIBET: Chumbi Valley, 10,000 ft. (*R. W. G. Hingston*, July).

Type in the British Museum.

33 **Dorcus velutinus.** (Plate XII, fig. 12.)

Dorcus velutinus Thoms.,* Ann. Soc. Ent. Fr. (4) ii, 1862, p. 426; Arrow, Ann. Mag. Nat. Hist. (11) ii, 1938, p. 55, pl. 4, fig. 6.
Gnaphaloryx cinereus Boil.,* Bull. Soc. Ent. Fr. 1902, p. 321.

Black, closely covered above with a brown earthy matter and short erect setæ and rather less closely beneath with rusty-red setæ and short hairs. Elongate, parallel-sided, moderately depressed, with rather short legs and antennæ, the upper surface entirely opaque, the head and pronotum rather closely clothed with short erect tufts of brown setæ. The head flat, the eye fairly large and almost divided by the

rounded, not very prominent, canthus. The front angles of the pronotum not very blunt, the sides gently rounded in front and strongly behind, without distinct lateral or basal angles, and the base almost straight. The elytra each bear five longitudinal series of short erect setæ, composed of small tufts upon the posterior half but almost continuous upon the anterior half, the intervals containing two or three rows each of very close punctures, generally obscured by earthy matter, and minute setose tufts, the shoulders not angulate. The middle of the metasternum fairly closely punctured, the sides densely rugose or granulate and the abdomen very strongly and closely punctured beneath. The prosternum elevated and angular behind but not pointed and scarcely compressed. The joints 2–7 of the antenna very short and the three club-joints of moderate length.

♀. The *head* bears a pair of small shining tubercles in its anterior part. The mandibles are rather straight and narrow, with a small and rather sharp internal tooth. The clypeal process is prominent, narrow and tongue-like. The cephalic tubercles are small and sometimes difficult to distinguish. The front *tibia* is palmate with three short terminal teeth and a fourth on the upper surface and the middle tibia has a lateral spine.

♂. The *head* is flat, short and broad. The mandibles are larger than those of the female, strongly curved, broad at the base, where they are rather sharply angulate externally, and far apart. They are finely punctured and opaque above and smooth and shining beneath and each has a slight rounded expansion of the upper surface internally a little before the tip, which is acutely pointed. The clypeal process is straight, broad and very short. The front *tibia* has a short terminal fork and is rather feebly toothed externally and the middle and hind tibiæ are setose and without lateral spines.

♂. *Length* (with mandibles), 22–25 mm. ; (without mandibles) 20–22 mm. : *breadth*, 7·5–9 mm.

♀. *Length*, 19–21 mm. ; *breadth*, 7·5–8·5 mm.

BURMA : Ruby mines (*W. Doherty*). DARJEELING DISTR. : Pedong (*L. Durel*) ; Pashok, 2000 ft. (*L. C. Hartless*, June) ; Gopaldhara, Rungbong Valley (*H. Stevens*).

Type in the René Oberthür collection ; that of *cinereus* in the Paris Museum.

34. **Dorcus ursulus.** (Plate XII, fig. 11.)

Dorcus ursulus Arrow,* Ann. Mag. Nat. Hist. (11) ii, 1938, p. 55, pl. 4, fig. 5.

Dull black, the lower surface and legs clothed with short yellowish-grey hairs, the upper surface bearing short erect setæ and covered with a brown earthy matter, the head

and pronotum rather closely clothed with short erect tufts of brown setæ. Elongate, parallel-sided, depressed, with short legs and antennæ. The eye almost completely divided by the rounded canthus. The sides of the pronotum not toothed, strongly rounded behind. The elytra each bear five longitudinal lines composed of tufts of erect setæ, the tufts upon the anterior half longer than those of the posterior half, and the shoulders are blunt. The prosternum elevated and angular behind but not produced. The metasternum finely and closely punctured in the middle, densely granular at the sides, the abdomen strongly punctured beneath.

♀. The *head* bears a pair of very small shining tubercles, not far apart, between the eyes. The mandibles are narrow and almost straight, with a small sharp internal tooth, and the clypeal process is rounded and very small. The front *tibia* is narrow, with a broad extremity, a blunt tooth on the upper surface and three short terminal teeth. The middle tibia has a minute lateral spine and the hind tibia is unarmed.

♂. The *head* is short and broad, the clypeal process very broad, short and straight. The mandibles are short, rounded, far apart at the base, where they are angulate externally, and armed internally with a small quadrate tooth placed obliquely, a little before the tip. The front *tibia* bears minute lateral teeth and the terminal fork is short. The middle and hind tibiæ are setose and without lateral spines.

♂. *Length* (with mandibles), 23–26 mm. ; (without mandibles) 20–23 mm. : *breadth*, 8·5–10 mm.

♀. *Length*, 19 mm. ; *breadth*, 8 mm.

Darjeeling Distr. : Pedong (*L. Durel*).

Type in the British Museum ; co-types in the René Oberthür collection.

This is a rather shorter and broader insect than *D. velutinus* and the longitudinal lines formed by erect setæ are not continuous upon the anterior half of the elytra but broken up into short tufts. In addition, the mandible of the male, instead of a gradual dilatation of the inner edge, as in *velutinus*, has an abrupt and very blunt tooth a little before the end. Full-sized males have the prothorax very broad and the outer edges not parallel but diverging forwards.

35. **Dorcus cylindricus.** (Plate XII, fig. 10.)

Dorcus cylindricus Thoms., Ann. Soc. Ent. France, 1862, p. 427.
Gnaphaloryx cylindricus van Roon, Coleopt. Cat. Lucan. 1910, p. 39.
Dorcus rosti Zang,* Deutsche Ent. Zeitschr. 1906, p. 184.
Dorcus bobi Did., Bull. Soc. Ent. France, 1927, p. 191, figs. 1–3.

Black, with an opaque sooty bloom on the upper surface and a clothing of very minute erect setæ, forming longitudinal lines upon the elytra, but sometimes denuded ; the sides of

the metasternum thinly clothed with yellow hair. Narrowly elongate, parallel-sided and convex, with the legs short and slight. The head densely rugose, with a pair of tubercles, sometimes very inconspicuous, in the middle, the eyes almost divided by the canthus. The epistome almost semicircular. The pronotum rugose at the sides and coarsely and confluently punctured in the middle. The front angle blunt, the lateral margin feebly curved to the lateral angle, which, like the hind angle, is ill-defined, and the base almost straight. The elytra bear numerous series of shallow confluent punctures, separated by narrow costæ, but confused at the sides and apices. The shoulders are acute. The prosternum elevated but not compressed nor pointed behind. The metasternum shining and strongly punctured in the middle, where there is a deep median groove, and densely rugose or granular at the sides. The abdomen strongly and densely punctured beneath. The antennæ very short, with all the joints, except the scape, strongly transverse.

♀. The *head* bears a pair of minute rather inconspicuous tubercles. The mandibles are rather narrow, acutely pointed and furnished with a short sharp internal tooth directed slightly downward. The front *tibia* is broad, palmate at the end, with three short external teeth and an upper supplementary tooth. The middle and hind tibiæ have each a sharp lateral spine.

♂. The *head* bears a pair of small transverse elevations, sometimes uniting to form a slight short ridge. The mandibles are very short, scarcely longer than those of the female but rather more slender, each armed with a small blunt tooth directed obliquely upward. The front *tibia* is more slender than that of the female and has a short broad terminal fork. The middle tibia bears a sharp lateral spine and the hind tibia a very minute one or none.

Length, 13–19·5 mm. ; *breadth*, 5–7·5 mm.

KASHMIR : Aish Mugam, 5500 ft. (*T. Bainbrigge Fletcher*, July) ; Ajan, Lolab Valley, 5500 ft. (*B. M. Bhatia*, May) ; Munda, 7200 ft. (*C. F. C. Beeson*, May).

PUNJAB : Kulu, Parbatti Valley, 6000–8000 ft. (*H. G. Champion*). UNITED PROVINCE : Kumaon, W. Almora (*H. G. Champion*, July, August) ; Kathian, Chakrata, 7000 ft. (*J. C. M. Gardner*, June).

Found in rotten wood and under bark. Mr. Bainbrigge Fletcher took a pair upon a Walnut tree.

Type in the René Oberthür collection ; that of *rosti* in the Deutsche Ent. Inst., Berlin ; that of *bobi* in Dr. Didier's collection.

The two sexes are almost alike and very careful examination is needed to discover the slight differences in legs and mandibles.

The figure stated to represent the female (quoted above under *D. bobi*), although it has the broad front tibiæ of the female, shows the mandibles of the male.

36. **Dorcus immundus.** (Plate XII, fig. 14.)

Dorcus immundus Arrow,* Ann. Mag. Nat. Hist. (11) ii, 1938, p. 56, pl. 4, fig. 8.

Sooty-black, the surface very dull and closely sculptured above and beneath ; moderately elongate, parallel-sided, the legs and antennæ short, the canthus long and narrowly separated from the cheek.

♀. Moderately elongate, very convex. The *head* is very closely and rugosely punctured, the canthus narrow, very little separated from the cheek but not laterally prominent. The *pronotum* is strongly and closely punctured dorsally, densely rugose at the sides. The front angle is rather sharp, the lateral margin rounded to the blunt lateral angle and feebly concave to the distinct but very blunt hind angle. The *elytra* are very densely rugose, with the lateral margins serrate and with uneven costæ upon the anterior dorsal part.

♂. Rather narrow, not very convex. The *head* is short and broad, the epistome very short and broad, the eyes very small, the sides with a very small prominence behind the eyes, which does not meet the canthus. The mandibles are short, strongly rounded, with a short truncate tooth placed beyond the middle on the upper surface. The *pronotum* is short, a little wider than the elytra, the sides a little rounded in front, with the front angles bluntly produced, straight to the lateral angles, which are sharp, and gently concave to the basal angles, which are very blunt but well marked. The *elytra* are distinctly but not evenly striate, with the base, sides and apices closely punctured, the striæ and the intervals very irregularly punctured. The *mentum* is rugose, the *prosternum* slightly compressed and pointed behind, the *metasternum* closely and coarsely granular and the abdomen closely punctured. The terminal fork of the front *tibia* is short but sharp, the middle tibia has a lateral spine and the hind tibia has none.

Variation of the male. In a small specimen the head and pronotum are closely punctured and the mandibles scarcely as long as the head. Larger males have the head only finely and lightly punctured and the mandibles a little longer than the head.

♂. *Length* (with mandibles), 19–25 mm. ; (without mandibles) 16·5–20 mm. : *breadth*, 7–9 mm.

♀. *Length*, 22 mm. : *breadth*, 9 mm.

S. India : Valparai, Coimbatore, 3500 ft. (*P. S. Nathan*, Oct.)

Four specimens of this insect were sent to me by M. Oberthür, who kindly allowed the *type* to be retained by the British Museum. A good series has since been received.

This species is very closely related to *D. rugosus* Boil. but a little narrower in shape. The eyes, as in that species, are almost completely divided. The side margins of the prothorax, which in both sexes of *D. rugosus* are rather strongly concave behind, are here only very gently excised so that the hind angles are less sharp and the lateral angle is also comparatively blunt. The prosternum is more prominent and angulate behind. The male is distinctly more elongate than that of *D. rugosus*, less convex and more parallel-sided. The mandibles attain a rather greater length and the tooth, which is of the same form, is placed before, instead of after, the middle. The pronotum is less coarsely sculptured and entirely dull, its side margins rather straight and the front angles very blunt. The elytra are less rugose and distinctly striate.

37. **Dorcus rugosus.** (Plate XII, fig. 13.)

Dorcus rugosus Boil.,* Bull. Soc. Ent. Fr. 1904, p. 39.
Eurytrachelus travancorica Gravely,* Rec. Ind. Mus. xi, 1915, p. 425, pl. 29, fig. 5.

Black, very closely sculptured and clothed upon the depressed parts of the upper surface with a brown earthy matter and upon the lower surface with rather scanty decumbent hairs or setæ, the tibiæ and tarsi with a conspicuous clothing of yellow hairs. Rather broad, compact and convex, with short antennæ and legs. The eyes are very nearly, but not quite, divided into upper and lower halves by the canthus, which is narrow and not prominent. The pronotum is coarsely punctured in the middle, with a feeble and indefinite median depression, and closely rugose at the sides. The front angles are acute, the lateral margins gently rounded to the lateral angles, which are sharp, and strongly concave to the hind angles, which are well marked but obtuse. The base is almost straight. The scutellum is closely rugose. The elytra are closely and finely rugose, with numerous ill-defined elevated longitudinal lines, which disappear at the sides and apices. The shoulders are acute. The metasternum is very coarsely and closely punctured in the middle and rugose at the sides and the abdomen is very strongly and closely punctured. The prosternum is elevated, rounded, not pointed or compressed behind. The third to seventh joints of the antenna are very compact and the three club-joints not very short. The middle and hind tibiæ have each a lateral spine.

♂. The *head* is coarsely rugose and without post-ocular

processes. The mandibles are acute, not broad nor strongly curved and there is only a feeble internal tooth. The clypeal process is prominent, rounded and not broad.

♂. The *head* is strongly punctured and has a slight lateral prominence behind the eye on each side. The mandibles are not much longer than those of the female but far apart. They are strongly curved and have a prominent blunt internal tooth placed just before the middle and directed obliquely upward. The clypeal process is very short and broad, with the front margin straight.

Variation of the male. In the smallest examples the head is rugosely punctured and the post-ocular process scarcely apparent. In larger specimens the head is broader, flatter, more finely and sparingly punctured, with the post-ocular prominence very small but distinct. The mandibles are relatively longer but always shorter than the head.

♂. *Length* (with mandibles), 16–23 mm.; (without mandibles) 14·5–20 mm.: *breadth*, 7–9 mm.

♀. *Length*, 18–22 mm.; *breadth*, 8–9·5 mm.

S. India: Madura; Shembaganur, Palni Hills, 6000 ft.; Kodaikanal, 5000–7000 ft.; Travancore, High Range, 6000 ft.

Type in the British Museum; that of *travancoricus* in the Indian Museum, Calcutta.

38. **Dorcus fulvonotatus.** (Plate XI, fig. 18.)

Cladognathus fulvonotatus Parry, Proc. Ent. Soc. Lond. 1863, p. 111; Trans. Ent. Soc. Lond. 1864, p. 28, pl. 6, fig. 3.

Black, sometimes with a feeble metallic lustre upon the elytra, the sides of the pronotum usually decorated with small anterior and posterior orange spots and each elytron showing a curvilinear orange streak near the extremity, almost reaching the suture, sometimes continued in a straight line to near the shoulder but more often interrupted in the middle and reappearing behind the shoulder. The femora orange-coloured in the middle and the tibiæ and abdomen may be red. Narrowly elongate, and not very convex, with the elytra extremely smooth and shining dorsally but with broad closely punctured outer margins. The pronotum short and broad, with the lateral margins rounded and the front angles a little produced. The prosternum strongly elevated behind and vertical, not pointed. The antennæ short, the three club-joints moderately long and the seventh joint sharply produced.

♀. The *head* is coarsely punctured, longitudinally grooved behind with a minute tubercle on each side of the groove. The clypeal process is transversely rounded and the mandibles are narrow, very acute, each with a strong internal tooth. The *pronotum* and *elytra* are very shining, the former very

strongly punctured at the sides, with the lateral margins rounded and not angulate and the front angles produced. The sides of the elytra are closely punctured but not opaque. The front *tibia* is very broadly and shortly forked at the end and the middle and hind tibiæ have each a minute spine.

♂. The *head* is broad, flat and entirely opaque, with the eyes rather prominent and the sides of the head very obtusely angulate in front of them and convergent behind. The clypeal process is broad, its front margin nearly straight and the angles sharply produced. The *pronotum* is very short and broad, very opaque at the sides and a little less so in the middle. The front angles are bluntly produced, the sides rounded and bluntly toothed far behind the middle. The *scutellum* is opaque. The *elytra* are extremely glossy, with the outer margins coriaceous and opaque. The front *tibia* is finely serrate externally, with small scattered supplementary teeth, and the terminal fork is short. The middle tibia has usually a minute lateral spine and the hind tibia is without one.

Variation of the male. In small specimens the mandibles are shorter than the head and each has a broad serrate lamina equidistant from the base and tip. The tip is simple and sharp. Full-sized males have the head broader, the mandibles from $1\frac{1}{2}$ times to twice the length of the head, flat, of nearly uniform breadth, gently and uniformly curved, with a small tooth just before the tip and a small process ending in two or three cusps a little behind the tooth. I have not seen any intermediate condition.

♂. *Length* (with mandibles), 20–28 mm.; (without mandibles) 17–21 mm.: *breadth*, 7–8·5 mm.

♀. *Length*, 19 mm.; *breadth*, 7 mm.

Sikkim: Tendong, 5000 ft., July. Darjeeling Distr.: Kurseong, 6000 ft. (*E. A. D'Abreu*); Mangpu (*E. T. Atkinson*); Pedong (*L. Durel*). United Province: W. Almora, Kumaon (*H. G. Champion*, February, June).

Type in M. René Oberthür's collection.

39. **Dorcus bisignatus.** (Plate XI, fig. 17.)

Cladognathus bisignatus Parry, Proc. Ent. Soc. Lond. 1862, p. 111; Trans. Ent. Soc. Lond. 1864, p. 28, pl. 7, figs. 3 & 5.
Hemisodorcus rufonotatus Pouill., Insecta, iii, 1914, p. 330, fig. 6.

Black, with a curvilinear orange streak just before the extremity of each elytron, the two streaks sometimes almost meeting at the suture, forming a semicircle, but sometimes much reduced, the femora orange-coloured beneath, except at the base and apex. Rather narrowly elongate and not very convex, with the elytra extremely smooth and shining dorsally, with broad opaque outer margins sharply separated

from the shining inner part. The prothorax is short and broad, with the sides almost straight in front. The prosternum strongly elevated and vertical behind but scarcely produced. The three terminal joints of the antenna moderately long and the seventh joint sharply produced.

♀. The *head* is strongly punctured, the punctures very close and confluent in front, not very close in the middle or behind. There is a small tubercle on each side, with a slight excavation between. The clypeal process is tongue-shaped and the mandibles have each a small blunt tooth. The sides of the *pronotum* are closely punctured and dull, the middle very minutely punctured and shining. The front angles are rather sharply produced, the sides very feebly curved and bluntly angulate behind. The sides of the *elytra* are densely and not very finely punctured and dull and the dorsal part is very glossy, with fine irregular punctures.

♂. The *head* is broad, flat and entirely dull, with the eyes rather prominent and the sides very obtusely angulate in front of them and convergent behind. The clypeal process is broad, with its front margin nearly straight and the angles sharp. The *pronotum* is short and broad, very dull at the sides and a little less so in the middle, with the lateral margins rounded in the middle, nearly straight to the front angles, which are strongly produced and obtusely angulate behind. The *elytra* are extremely glossy dorsally, with scanty minute punctures and the sides are very finely and densely punctured and entirely dull. The front *tibia* is finely serrate externally, with a few small teeth placed far apart; the middle tibia has a lateral spine and the hind tibia has none.

Variation of the male. In a rather small specimen, with mandibles scarcely as long as the head these are curved externally, acute at the tip, and the greater part of the inner edge is formed by a broad lamina meeting that of the opposite side and feebly serrate. In larger specimens the mandibles are about twice as long as the head, flat and nearly straight, except near the base and tip, with a small tooth just before the tip and a short serrate lamina a little behind the tooth.

♂. *Length* (with mandibles), 18–31 mm.; (without mandibles) 16–23 mm.: *breadth*, 7–10 mm.

♀. *Length*, 21 mm.; *breadth*, 8·5 mm.

ASSAM: Manipur (*W. Doherty*). DARJEELING DISTR.: Kurseong (*R. P. Lebas*); Pedong (*L. Durel*).

Type in the René Oberthür collection, also that of *rufonotatus* Pouill.

There is a close resemblance between this species and *D. fulvonotatus*, but the sides of the pronotum are not strongly rounded in front, as in that species, and the pale thoracic spots of *D. fulvonotatus* appear to be always absent.

40. Dorcus boileaui. (Plate XIV, fig. 7.)

Rhætulus speciosus Boil.,* Trans. Ent. Soc. Lond. 1911, p. 437, pl. 37, fig. 3 (preoccupied name).
Rhætulus speciosus var. *boileaui* Did., Bull. Soc. Ent. Fr. 1925, p. 154 ; *id.* Col. Luc. du Globe, 1930, pl. 2, fig. 1.
R. speciosus var. *gardneri* Did.,* Col. Luc. du Globe, 1930, p. 128, pl. 11, fig. 2.

Shining black (♀) ; dull black, with the greater part of each elytron, or with parts of the head, pronotum and elytra orange ; or orange, with the mandibles, part of the head, the middle of the pronotum, the scutellum and a narrow sutural stripe dilating towards the base of the elytra black (♂). The femora usually red, except at the base and apex, in both sexes. Rather narrow in shape and not very convex, the sides of the prothorax rounded, serrate in the female, and bearing rather strong and close tubercles in the male. The prosternum very little elevated and not compressed or pointed behind.

♀. Black and shining. The *head* is rugosely punctured, with the ocular canthus moderately prominent laterally. The *pronotum* is strongly and closely punctured at the sides, very minutely and sparsely in the middle. The front angles are rather blunt, the sides finely serrate, gently rounded to past the middle, where there is a minute spine, and feebly concave to the hind angles, which are rounded. The *elytra* are closely but very finely punctured, with the sides and apices rather more strongly punctured but not opaque. The *mentum* is coarsely rugose. The *metasternum* and *abdomen* are rather dull but not distinctly punctured. The front *tibia* is stout, broadly forked at the end, with numerous short, sharp lateral teeth, and the middle and hind tibiæ have each a strong lateral spine.

♂. Black, not shining, with the elytra reddish-yellow, except a narrow outer margin and a sutural stripe triangularly dilated in front and reaching the shoulders ; sometimes also with patches of the yellow colour in each angle of the pronotum ; sometimes with the head more or less yellow, the pronotum with a broad yellow margin on each side, but with the extreme outer edge and a median spot on each side black, and the elytra yellow, with very narrow black external and sutural margins. The femora and the sides of the metasternum may be more or less decorated with the yellow colour.

The *head* is short, not very large but relatively broad, very finely and densely granular. The ocular canthus is very obtusely angular in front and extends to the middle of the eye and the sides are strongly convergent behind the eyes. The clypeal process is large, transversely pentagonal, rather sharply tridentate in front. The mandibles are very long and slender, strongly arched, studded internally with closely-set

fine tubercles and forked at the end. The *pronotum* is also finely and densely granular, entirely opaque at the sides and feebly shining in the middle, the front angle blunt, the lateral edge rounded and rather closely and conspicuously studded with prominent tubercles to the obtuse outer angle and then nearly straight to the hind angle, which is rounded. The *elytra* are long, alutaceous and not shining, the lateral margins rather narrowly opaque, the outer edges rather strongly reflexed. The *mentum* and *submentum* are densely granular and opaque, the *metasternum* and *abdomen* dull and almost unpunctured. The *legs* are rather slender, the front tibia rather closely toothed externally and strongly forked at the end, the middle tibia strongly and the hind tibia feebly spined in the middle.

♂. *Length* (with mandibles), 50–56 mm.; (without mandibles) 35–38 mm. : *breadth*, 15 mm.

♀. *Length*, 27 mm.; *breadth*, 11 mm.

ASSAM: Garo Hills, above Tura, 3900 ft. (*S. Kemp*, July). BURMA: Thandaung, 5000 ft. (*O. C. Ollenbach*, July). SIAM. INDO-CHINA: Laos, Piahat. FEDERATED MALAY STATES: Pahang, Fraser's Hill, Cameron Highlands, 4700 ft. (May, July).

Type of *boileaui* Did. in the Paris Museum, those of *speciosus* Boil. and var. *gardneri* in the British Museum. The difference between the two latter specimens is not as great as the figures given by Dr. Didier seem to indicate.

The coloration of the male is very variable. Females have been attracted by light in the Malay Peninsula, where the male has not yet been found.

41. **Dorcus titanus.** (Plate VII, figs. 1–4.)

Lucanus titanus Boisd., Voy. de l'Astrolabe, Ent. ii, 1835, p. 237.
Dorcus titan Burm., Handb. Ent. v, 1847, p. 384.
Platyprosopus platymelus Saund.,* Trans. Ent. Soc. 1854, p. 50, pl. 3, fig. 7.
Dorcus marginalis Saund., *op. cit.* p. 53, pl. 4, fig. 6.
Dorcus obscurus Saund., *op. cit.* p. 52, pl. 4, fig. 7.
Dorcus westermanni Hope,* Trans. Linn. Soc. xix, 1843, p. 106.
Dorcus titanus Arrow, Trans. R. Ent. Soc. Lond. lxxxvi, 1937, p. 244.

Entirely black, smooth and shining above in the ♀, dull (except in small examples) in the male. The canthus reaches far beyond the middle of the eye and almost divides it. The prosternum is scarcely elevated behind the coxæ, and not produced.

♀. Elongate-oval, not very convex, the legs fairly stout. The *head* is rather coarsely, closely and evenly rugose, slightly convex in the middle, where there is a pair of rather inconspicuous tubercles placed transversely. The head is broad but the lateral angulation is feeble. The clypeal process is rounded

and feebly bilobed. The *pronotum* is very smooth, the sides strongly and closely punctured, densely and rugosely at the margins. The punctures extend narrowly along the basal margin. The lateral margins are gently rounded to far beyond the middle, where they are very bluntly angular, and the hind angles are scarcely perceptible. The *elytra* are rather closely punctured, the punctures very minute and inconspicuous near the suture but becoming gradually more numerous, those of the sides and apices dense and confluent. There are three narrow pairs of fine longitudinally arranged punctures. The *mentum* is very coarsely rugose. The front *tibia* bears numerous rather close short teeth and the terminal fork is very short. The middle and hind tibiæ have each a sharp lateral spine.

♂. The *body* is rather depressed, the upper surface (except in small specimens) densely granular and opaque. The sides of the head are very obtusely angular in front and feebly rounded and a little contracted behind the eyes. The clypeal process is rather short and broad, notched in the middle and angularly produced on each side. The *pronotum* is broad, its lateral margins bisinuate to the lateral angle, which is sharp and placed before the middle, then rather straight to the hind angles, which are also sharp. The *elytra* are rather short, with the shoulders very sharp and the outer edges gently rounded and converging to the apex. The *mentum* is broad, closely granular and densely clothed in the anterior half with short reddish hairs. The front *tibia* bears numerous short sharp lateral teeth and the terminal fork is very short. The middle and hind tibiæ have each a sharp lateral spine.

Variation of the male. In small specimens the upper surface, instead of being dull, is very smooth and shining. The head is strongly punctured, except its posterior part. The pronotum is rugosely punctured at the sides and very glossy on the disc, with its lateral and basal angles feeble. The elytra are distinctly punctured, strongly and closely at the sides, and more parallel-sided than in larger examples. The clypeal process is only feebly notched, the mentum is coarsely rugose and the mandibles are short, not continuous, strongly curved, with a feebly serrate dilatation of the inner edge not reaching the base or tip. In larger specimens this dilatation is strongly serrate and has a strong tooth at its posterior end, the punctures of head and thorax become gradually replaced by fine granulations and those of the elytra become much finer and more indistinct. As the mandibles increase in length the strong basal tooth removes farther from their base and a minute tooth appears shortly before the tip. In large specimens the labrum is so deeply notched as to become bilobed and the entire upper surface is dull and sooty.

♂. *Length* (with mandibles), 35–90 mm.; (without mandibles) 30–67 mm.: *breadth*, 12–28 mm.

♀. *Length*, 21–40 mm.; *breadth*, 8·5–16 mm.

DARJEELING DISTR.: Pedong (*L. Durel*); Mangpu (*E. T. Atkinson*). ASSAM: Cherrapunji; Sylhet; Sibsagar (*E. T. Atkinson*). BURMA: Sumpra Bum, Putao Distr. (*B. Fischer*, April, May). TONKIN. CHINA. JAPAN. MALAY PENINSULA. BORNEO. PHILIPPINE ISLANDS. CELEBES.

Location of the *type* unknown, that of *platymelus* Saund. in the British Museum, those of *marginalis* and *obscurus* Saund. perhaps also there but unidentified, that of *westermanni* Hope in the Hope Dept., Oxford University Museum.

Burmese specimens belong to the form called *platymelus*, in which the mandibles of well-developed males are relatively narrower than in those of India proper. This form is found in Japan and China. Females and small males, however, are indistinguishable.

42. **Dorcus tityus.** (Plate VIII, figs. 2–6.)

Dorcus tityus Hope,* Proc. Ent. Soc. Lond. 1842, p. 83.
Eurytrachelus tityus Parry, Trans. Ent. Soc. Lond. 1870, p. 61, pl. 3, fig. 3; Boil., Trans. Ent. Soc. Lond. 1913, p. 249.
Eurytrachelus semirugosus Thoms., Ann. Soc. Ent. France (4), i, 1862, p. 422.
Eurytrachel'elus tethys Did., Col. Luc. du Globe, 1929, p. 115, figs. 66, 69, 70, 72.
Eurytrachelus tethys Did., *op. cit.* 1930, p. 185.
Eurytrachelus fuliginosus Did., Col. Luc. du Globe, fig. 33 (but not description).
♀. *Lucanus lineatopunctatus* Hope,* Gray's Zool. Misc. 1831, p. 22.
Dorcus punctatostriatus Redt., Hugel's Kaschmir, 1848, iv. p. 532.

Black, with a scanty clothing of inconspicuous yellowish hair beneath. The prosternum feebly elevated and not pointed, forming a rounded projection behind the coxæ. The middle and hind tibiæ have each a sharp lateral spine.

♀. Elongate-oval, moderately shining above, but with the elytra very closely and deeply sulcate. The *head* is strongly and closely punctured, rugosely in front, with a narrow smooth area behind, and bears two small inconspicuous tubercles placed transversely in the middle. The canthus extends far beyond the middle of the eye but is not prominent. The *pronotum* is shining, with the sides strongly punctured, the punctures dense and rugose externally and extending along the basal margin. There is a double series of punctures in the middle of the pronotum, generally enclosing a narrow oval area. The lateral margin is gently rounded, the lateral angle not distinct. The *scutellum* bears a few fine punctures. The *elytra* have about twelve deep grooves, confluently and unequally punctured, with narrow shining intervals. The grooves are obliterated at the sides and apices, which are

densely rugose and opaque. The *mentum* is coarsely rugose. The *metasternum* is finely punctured in the middle, densely rugose at the sides and the *abdomen* is closely punctured. The terminal fork of the front *tibia* is short and broad.

♂. Rather depressed. The *head* is smooth, with the clypeal process short and rather broad, the angles rather sharp. The eye is small and almost divided by the canthus, which is very narrow and not at all prominent. The sides of the head are feebly prominent behind the eyes. The *pronotum* is smooth, margined at the base but not in front, the lateral margins excised behind the front angles, forming a sharp angle behind the excision, and straight and convergent to the basal angles, which are sharp. The *elytra* are smooth or sulcate.

Variation of the male. Small specimens resemble the female. The pronotum is shining, with the sides rugosely punctured, and the elytra are closely grooved, with densely rugose sides and apices. The head is smooth and shining, with its anterior part closely punctured. The mandibles are short, strongly curved, with a very small blunt tooth near the middle of the inner edge. The anterior excision of the sides of the thorax is absent in small specimens. In larger examples the punctures disappear from head and thorax and the surface becomes coriaceous and dull; the elytral grooves gradually disappear, leaving only a close and fine puncturation, except for the rugose sides. In large specimens the elytra are slightly coriaceous and without punctures. The mandibles become longer and less curved, the internal tooth becomes broad and at a further stage appears as two separate teeth, which are supplemented by another near the tip. The hindmost tooth is always more prominent than the rest and in large specimens is rather strong. A very variable number of minute teeth may appear beyond it, not always alike on the two sides. The situation of the large tooth varies greatly. It is often near the base (*tityus* type) but sometimes more advanced and may even approach the middle (*tethys*).

♂. *Length* (with mandibles), 28–70 mm.; (without mandibles) 24–52 mm.: *breadth*, 11–25 mm.

♀. *Length*, 21–29 mm.; *breadth*, 9–12 mm.

Nepal: (*Maj.-Gen. Hardwicke*). Sikkim: Gopaldhara, Rungbong Valley (*H. Stevens*). Darjeeling Distr.: Pedong (*L. Durel*); Kurseong (*E. A. D'Abreu*); Mangpu (*E. T. Atkinson*). Assam: Sylhet. Burma: Ruby Mines (*W. Doherty*); Seinghku Valley, 6000 ft. (*R. J. H. Kaulbach*).

Types of *tityus* and *lineatopunctatus* in the British Museum; that of *semirugosus* in the Oberthür collection; of *punctatostriatus* in the Vienna Museum, and of *tethys* in Dr. Didier's collection.

The figure 33 of Dr. Didier's work, although called *Eurytrachelus fuliginosus*, does not agree with the accompanying description and was probably included by accident.

43. **Dorcus submolaris.** (Plate IX, fig. 9.)

Lucanus submolaris Hope & Westw.,* Cat. Luc. Col. 1845, p. 23.
Eurytrachelus submolaris Boil., Trans. Ent. Soc. Lond. 1913, p. 251, pl. 9, fig. 10; Gravely, Ind. Mus. Rec. ix, 1915, p. 424, pl. 29, fig. 4.
Dorcus brachycerus Boil., Bull. Soc. Ent. Fr. 1904, p. 27.
Eurytrachelus fuliginosus Did.,* Col. Luc. du Globe, 1928, p. 77, fig. 34.

Black, fairly broad and depressed, more or less shining above, the female with closely striate elytra, the male rather smooth above, except in dwarfed specimens. The eyes small, the ocular canthus narrow and not prominent, but extending far back and almost dividing the eye. The prosternum not pointed but forming a rounded projection behind the coxæ.

♀. Elongate-oval, with the legs short and stout. The *head* is strongly, closely and rather rugosely punctured, with two slightly elevated tubercles placed transversely in the middle and not far apart. The sides of the head diverge a little behind but are not prominent. The *pronotum* is very smooth and shining, with a few fine punctures, generally forming an imperfect double series in the middle of the posterior half. The sides are very strongly and closely punctured, the punctures extending round the basal margin and forming a single series in the middle. The front angles are blunt, the lateral edges feebly curved to the lateral angle, which is obtuse, and almost straight from there to the base. The *scutellum* is very minutely punctured. The *elytra* have very acute shoulders, the dorsal part is punctate-striate but not very deeply, the second interval broad and shining with a few punctures along the middle, and the sides are densely and rugosely punctured. The *metasternum* is densely and rugosely granular at the sides and finely punctured in the middle and the *abdomen* is finely punctured in the middle and coarsely pitted at the sides. The front *tibia* is broadly bifid at the end and the middle and hind tibiæ have each a rather strong spine beyond the middle of the outer edge.

♂. Smooth, not very shining, except in dwarfed specimens, the *head* and pronotum opaque, the sides of the head slightly convergent in front of the eyes, bluntly angular behind. The clypeal process is short and broad (about one-third the width of the head), with the angles feebly produced. The *pronotum* is smooth, with the sides finely and feebly punctured. The outer edge is feebly curved to the obtuse lateral angle and nearly straight from there to the base. The *scutellum* is

finely punctured. The *elytra* are rather parallel-sided, with acute humeral angles and the sides and apices densely punctured. The *metasternum* is almost smooth in the middle and densely rugose at the sides. The *abdomen* is finely punctured in the middle and more strongly at the sides. The *legs* are rather closely clothed with reddish setæ, the middle tibia bears a strong lateral spine and the hind tibia a minute one.

Variation of the male. In dwarfed males the head is finely punctured, the pronotum smooth and shining, except at the sides, and the elytra are striate, as in the females, but less deeply. The short mandibles have only a very slight indication of a tooth internally. In larger examples the striæ gradually disappear, leaving only a finely punctured surface to the elytra. This also disappears and the entire upper surface is smooth and opaque in large specimens. The mandible exhibits first a second and finally a third tooth, the last near the tip.

♂. *Length* (with mandibles), 21–41 mm.; (without mandibles) 19–33 mm.: *breadth*, 8·5–14 mm.

♀. *Length*, 20–29 mm.; *breadth*, 8–12 mm.

N.W. Frontier Province. Kashmir: Rajpur Rampur (*F. Selous*). Punjab: Murree Hills, Thobba (*Major Howland Roberts*); Campbellpore; Dalhousie. United Provinces: Naini Tal.

Type in the Hope Dept., Oxford University Museum; those of *brachycerus* Boil. and *fuliginosus* Did. in the Paris Museum.

This species closely resembles *D. tityus*, but the female has less deeply striate elytra, and this applies also to the small males. Well-developed males, in which the upper surface is quite smooth, closely resemble medium-sized males of *D. tityus* in form, as well as in the mandibles, but the elytra are striate in *D. tityus* at this stage.

The large specimen represented by Didier (fig. 33) as belonging to *E. fuliginosus* corresponds exactly with one in the British Museum taken by W. Doherty in Burma (Ruby mines) and appears to me to be a variety of *D. tityus* Hope. It is a glossy insect, differing markedly from specimens received from Dr. Didier as *D. fuliginosus* and from his description of the species, the type of which is said to be from Kashmir. The latter entirely agrees with the present insect. The name *fuliginosus* evidently designates a non-glossy insect.

The type in the Oxford Museum is labelled as taken in Assam by Dr. Cantor. This is no doubt an error.

44. **Dorcus reichei.** (Plate VIII. figs. 7–9.)

Lucanus reichei Hope,* Proc. Ent. Soc. Lond. 1842, p. 83.
Lucanus cognatus Hope,* *op. cit.* p. 84.
L. punctilabris Hope, *l. c.*

Dorcus glabripennis Westw.,* Trans. Ent. Soc. Lond. 1871, p. 359, pl. 8, fig. 6.
Eurytrachelus præcellens Moll., Insektenborse, xix, 1902, p. 283; Deutsche Ent. Zeits. 1903, p. 344.
Eurytrachelus reichei Boil., Trans. Ent. Soc. Lond. 1913, p. 249.
var. *Eurytrachelus castelnaudi* Deyr., Ann. Soc. Ent. Belg. ix, 1865, p. 31, pl. 2, fig. 3.
Eurytrachelus hansteini Albers, Deutsche Ent. Zeits. 1889, p. 235.
Eurytrachelus cervulus Boil., Bull. Soc. Ent. France, 1901, p. 284.

Black, the male very smooth above when well developed, the female with deeply sulcate elytra. The shoulders of the elytra very acute. The legs fairly short and stout. The prosternum not pointed behind the front coxæ but forming a slight rounded protuberance, except in the males of the variety *castelnaudi*, where it is flat and not at all elevated behind. The middle and hind tibiæ have each a sharp lateral spine.

♀. Elongate-oval, shining above but with the elytra very closely and deeply sulcate. The *head* is strongly and closely punctured, rugosely in front, with a narrow smooth area behind, and bears two small, not very conspicuous, tubercles placed transversely in the middle. The canthus extends well beyond the middle of the eye but is not prominent. The *pronotum* is very smooth and shining, with the sides strongly punctured, the punctures very dense and rugose externally and extending completely along the basal groove. The front angle is bluntly produced, the lateral margin gently rounded, the lateral and basal angles rounded and imperceptible. The *scutellum* bears a few fine punctures. The *elytra* have each about 10 or 12 deep grooves, with narrow shining intervals, the grooves confluently and unequally punctured. The grooves become obliterated in the lateral part and the apices, which are densely rugose and opaque. The mentum is coarsely rugose. The *metasternum* is closely punctured, rugosely at the sides, and the abdomen strongly but less closely. The terminal fork of the front *tibia* is short and broad.

♂. In well-developed males the body is broad and flat, very smooth above, the *head* very broad and the mandibles long, but every stage of transition occurs, in accordance with diminishing size, to small specimens, which show most of the superficial features of the female.

Variation of the male. In the smallest specimens the head and thorax are shining, the head of moderate size, closely and rather strongly punctured, except in the posterior part, the pronotum coarsely and rugosely punctured at the sides and base, usually with scattered punctures along the middle line, the sides evenly rounded, the lateral angle indistinct. The elytra are grooved like those of the female, the grooves wide and deep and the intervals very narrow and sharp.

The mandibles are shorter than the head, simple, falciform, far apart at the base and very acute at the tip. There is a slight indication of a tooth at the base. The clypeal process is very short, broad, with the front edge straight and fringed. In larger specimens the head is a little broader and more finely punctured and the mandibles show a strong horizontal tooth at the base. At a farther advance the head becomes dull and little punctured, the puncturation of the pronotum diminishes, the sides are less rounded, the lateral angle more distinct, and a slight indentation appears near the front angle. The grooves of the elytra are shallower and the intervals wider. In moderate-sized males the head and thorax are dull and unpunctured, the head is longer behind the eyes, which are less prominent, the elytra are smooth dorsally, with traces of lateral striæ, the sides strongly and closely punctured. The mandibles are longer, the tooth a little removed from the base and shorter and broader in shape. With still lengthening mandibles, the tooth continues to advance to the middle and to become shorter, while a second tooth appears in front of the first and another minute one behind the tip of the mandible. The angles of the clypeal process are a little produced and its front margin becomes curved. In large males the mandibular process is in front of the middle, short and 2-cusped, the head and thorax are very broad, the indentation of the lateral margin of the latter is farther from the front angle and leaves a rather sharp tooth behind, near the middle, the lateral angle is also sharp, the elytra are glossy, without trace of striation, the sides closely and regularly punctured. In the largest examples the mandibles are slender but flattened, rather straight, twice as long as the head, the 2-cusped process is situated much before the middle and directed obliquely forward.

♂. *Length* (with mandibles), 20–56 mm.; (without mandibles) 18–43 mm.: *breadth*, 8–20 mm.

♀. *Length*, 19–29 mm.; *breadth*, 8–13 mm.

DARJEELING DISTR.: Kurseong (*E. A. D'Abreu*); Mangpu (*E. T. Atkinson*); Gopaldhara, Rungbong Valley (*H. Stevens*); Pedong (*L. Durel*). ASSAM. BURMA: Ruby Mines (*W. Doherty*). W. CHINA. SIAM. MALAY PENINSULA. SUMATRA. BORNEO.

Types of *reichei*, *cognatus* and *glabripennis* in the British Museum, those of *castelnaudi* and *prœcellens* in the Oberthür collection, that of *cervulus* in the Genoa Museum.

Specimens from the Eastern part of the range of this species constitute a phase which has been separated by various authors and given the names *castelnaudi*, *cervulus* and *hansteini*. In the males not of very small size the surface of the elytra, as well as that of the head and pronotum, is dull and sooty,

the prosternum is very flat behind and not at all elevated. In small specimens, however, and in the female this is elevated exactly as in the typical form. Occasionally, as in the type-specimen of *castelnaudi* Deyr., the elytra are not quite black, but, at least in part, very dark red or brown, probably owing to slight immaturity.

In my opinion, the Bornean *Eurytrachelus prosti* Boil., will also be found inseparable from this form.

I have seen examples of this form from Assam, Burma, Siam, Yunnan, Sumatra and Borneo.

45. **Dorcus hyperion.** (Plate VIII, fig. 10.)

Dorcus hyperion Boil., Bull. Soc. Ent. France, 1899, p. 177.

Black, smooth, not very shining, the elytra deeply-striate in females and small males, the sides clothed beneath with very fine inconspicuous yellowish pubescence. The eyes very small, almost divided by the narrow canthus. The metasternum coarsely granular at the sides. The legs are not long, the front tibia has a short terminal fork and is sharply and regularly toothed externally and the four posterior tibiæ have each a lateral spine.

♀. Rather narrowly elongate, moderately convex. The *head* is rugosely punctured, with a pair of small tubercles not far apart in the middle, the canthus is obliquely rounded and extends far back but is only slightly prominent. The *pronotum* is dull but very smooth, with the sides narrowly but strongly and closely punctured. The front angles are strongly produced, the lateral margins gently rounded, the lateral angles feebly indicated and the hind angles obsolete. The *elytra* are fairly long and very deeply striate, with large confluent punctures in the striæ, the intervals between the striæ shining, the inner ones fairly broad, the outer ones very narrow, the striæ obliterated at the sides and apices, which are densely rugose. The shoulders are sharply angular. The *mentum* is closely rugose. The *prosternum* is elevated and rounded behind. The front *tibia* is fairly stout and the middle and hind tibiæ have each a strong lateral spine.

♂. Broad and depressed, with the elytra rather short, tapering behind. The *head* and pronotum are broad and flat, minutely granular and opaque, finely punctured in small specimens. The sides of the head are rather parallel, the eyes minute and almost divided by the very narrow canthus, the sides with a slight bluntly angular process far behind the eye. The clypeal process is very short and has two slight cusps. The *pronotum* is short, the front angles are bluntly pointed, the sides a little excised in front, leaving a distinct angle behind the excision, almost from this to the obtuse lateral

angle, which is situated far back, and gently curved to the base. The *elytra* are shining and finely punctured, the shoulders sharply angular and the sides rounded. The *mentum* is very broad and opaque. The *prosternum* is broad, flat, truncate behind and not at all elevated.

Variation of the male. In small specimens the head and pronotum are shining and bear very fine scattered punctures, and the elytra, as in the female, are deeply striate, the inner intervals broad, minutely punctured and very shining, the outer part finely rugose and dull, with very narrow intervals. The mandibles are short and sharp, evenly curved and armed internally close to the base with a strong blunt process set at right angles. With increased size the elytral grooves disappear, as well as the punctures of head and thorax, which become quite dull. In full-sized males the elytra are smooth and shining, with minute punctures, the outer margins slightly dull but not more closely punctured. The head is very broad, the mandibles are about twice the length of the head, almost straight in the basal part, the basal process flat and two-cusped, with a minute ante-apical tooth internally. The excision of the lateral margin of the prothorax is well marked.

♂. *Length* (with mandibles), 33–62 mm.; (without mandibles) 29–46 mm. : *breadth*, 14–22 mm.

♀. *Length*, 28 mm. ; *breadth*, 12 mm.

Burma : Ruby Mines (*W. Doherty*).

Type in the Paris Museum, co-types in the René Oberthür collection.

46. Dorcus sewertzowi.

Dorcus sewertzowi Sem., Horæ Soc. Ent. Ross. xxv, 1891, p. 309.
Dorcus rugatus Did., Bull Soc. Ent. France, 1927, p. 193.

Black and moderately shining, with the tarsi and the sides of the metasternum clothed, the latter rather thinly, with yellow hair. Compact and convex, parallel-sided, cylindrical but not long, the legs and antennæ rather short. The posterior median part of the head is smooth and shining, the ocular canthus very slightly developed but extending past the middle of the eye. The pronotum very shining, rather finely and sparsely punctured in the median part and strongly and densely at the sides, the front angles rather blunt, the sides almost straight to the sharp lateral angles and then sinuate to the strongly marked hind angles. The base is almost straight. The scutellum bears a few punctures. The elytra closely and confluently punctured, with rather ill-defined dorsal striæ, which disappear upon the sides and posterior part. The shoulders sharp-angled. The metasternum very smooth and shining in the middle, with very minute scattered punctures, and the sides rugose. The abdomen rather closely punctured

in the middle and rather sparingly at the sides. The prosternum very short and bluntly rounded behind. Joints 5–7 of the antennæ strongly transverse and 8–10 not very short. The front tibia broad and strongly toothed and the middle and hind tibiæ each having a lateral spine.

♀. The *head* is coarsely rugose, except in the posterior median part. The clypeal process is rounded and prominent and the mandibles are not much curved and rather feebly toothed at the inner edge.

♂. The *head* is rather evenly punctured, except in the posterior median part. The mandibles are not much longer than those of the female but far apart and more strongly curved. They are a little dilated externally at the base and bear a short blunt erect tooth at the outer basal angle and another directed obliquely inward and upward shortly before the tip. The clypeal process is short and broad, with the outer angles slightly prominent. The front *tibia* has a broad terminal fork.

Variation of the male. Small specimens have the head strongly and densely punctured and the mandibles only very slightly dilated at the base. In larger ones the head is more finely and sparingly punctured and the mandibles are angularly dilated externally and more strongly toothed.

♂. *Length* (with mandibles), 17–23 mm.; (without mandibles) 16–20 mm.: *breadth*, 7–9 mm.

♀. *Length*, 17 mm.; *breadth*, 7 mm.

KASHMIR (*C. Rost*). PUNJAB: Bashahr State, 6000–8000 ft. (*R. N. Parker*, May). E. BOKHARA.

Type in the Leningrad Museum; that of *rugatus* in Dr. Didier's collection. A male specimen in the British Museum, received from Dr. Didier, although not referred to in the original description, appears to be one of the typical series.

47. **Dorcus pouillaudei.** (Plate XII, fig. 18.)

Prosopocœlus pouillaudei Houlb.,* Insecta, v, 1915, p. 50, fig. 9.

♀. Black, with the femora and tibiæ red, except the bases and apices, the edge of the front tibia and patches upon the femora, which are black, the last three joints of the antenna also reddish and the tarsi clothed beneath with yellow hair-tufts. Rather long and narrow in shape, with the head, pronotum and scutellum closely sculptured and opaque and the elytra densely sculptured and opaque at the sides and very glossy dorsally. The *head* is coarsely rugose behind and rather finely in front. The mandibles are acutely pointed, evenly curved externally and bear a single strong median tooth internally. The *pronotum* is strongly and closely punctured in the middle, the punctures becoming coarse and

confluent on each side for one-third of the total width. The front angles are rather bluntly pointed and produced and the lateral margins are rather divergent and nearly straight from the front angle to well behind the middle, where they are very obtusely angulate, then nearly straight to the very obtuse hind angles. The *scutellum* is also strongly and closely punctured. The *elytra* are extremely smooth and shining, with moderately broad lateral margins strongly and confluently punctured, dilating a little in the apices, which are slightly produced and a little hollowed, and at the shoulders, which are acutely angular. A straight stria, not reaching the base or apex of the elytron, divides the glossy dorsal region from the opaque lateral margin. The *mentum* is coarsely rugose. The *prosternal process* is compressed and a little pointed behind. The *metasternum* is scantily punctured except at the sides. The *legs* are slender, the front tibia curving outwards, the apical part produced beyond the insertion of the tarsus, with a three or four lobed extremity. The outer edge is inconspicuously serrate, with minute and distant teeth. The middle and hind tibiæ are without spines. The three terminal joints of the *antennæ* are fairly long and the seventh joint little shorter.

Length, 19 mm.; *max. breadth*, 7·5 mm.

Sikkim.

Type in the Oberthür collection.

The male is unknown.

I have seen only the type specimen kindly lent by M. Oberthür.

48. **Dorcus laterotarsus.** (Plate XII, fig. 19.)

Prosopocœlus laterotarsus Houlb., Insecta, v, 1915, p. 21, figs. 5 & 6.

♀. Black and shining, with the head and broad, sharply defined, lateral margins of pronotum and elytra densely and rugosely punctured. Rather narrowly elongate and not very convex. The *head* is coarsely rugose, with a small smooth posterior area, the canthus rounded and not very prominent. The *pronotum* is smooth and shining upon the median third, closely and strongly punctured upon the outer third, rugosely at the outer margin. The front angles are blunt, the lateral edges minutely serrate and gently rounded to beyond the middle, where there is a minute spiniform angle, and then straight to the very broadly rounded hind angles. The *scutellum* bears a few fine punctures. The *elytra* are very glossy upon the inner half and very densely and rather coarsely punctured upon the outer half, which is very sharply defined and extends narrowly to the scutellum and broadly to the suture at the apex. The shoulders are very acutely angular and the apices a little produced. The *prosternum* is compressed

and shortly pointed behind; the *metasternum* bears scattered punctures and is dull at the sides and the *abdomen* is very smooth, except the terminal segment, which bears large, fairly closely and evenly distributed punctures. The *tibiæ* are slender, the front ones slightly curved, with the outer edge very minutely toothed and the extremity produced into a palmate lobe. The middle and hind tibiæ are without lateral spines and all the tarsi are rather short.

♂. Unknown.

Length, 21 mm.; *breadth*, 9 mm.

Assam: Patkai Hills (*W. Doherty*).

Type in the Oberthur collection. The British Museum possesses several specimens from the Fry collection, taken by Doherty at the same time as the type.

49. **Dorcus curvipes.** (Plate VI, fig. 1.)

Lucanus curvipes Hope & Westw.,* Cat. Luc. Col. 1845, p. 25.
Cladognathus curvipes Parry, Trans. Ent. Soc. Lond. 1864, p. 35.

Black, the female shining, the male dull above, very small, convex, rather compact, with slender but not long legs. The head is small, with rather large and prominent eyes, the canthus extending to the middle, the pronotum convex, a little wider in front than at the base with the lateral edges very minutely serrate, with an acute spine beyond the middle, feebly curved from there to the front angles, which are rounded, and straight to the hind angles, which are obtuse but distinct. The elytra short, entirely punctured, closely at the sides, with the shoulders sharply pointed. The prosternum a little compressed, bluntly pointed but not produced behind. The metasternum and abdomen smooth and shining, the former with scattered punctures. The middle and hind tibiæ have each an extremely minute lateral spine.

♀. Shining black, oval. The *head* is very small, a little contracted behind the eyes, densely and rugosely punctured. The mandibles are narrow and straight, with very sharp curved tips and a strong tooth near the middle of the inner edge. The *pronotum* is coarsely and densely punctured at the sides and fairly strongly and closely in the middle. The *elytra* are rather less strongly punctured than the pronotum, closely upon the outer half and not very closely upon the inner half. The *legs* are not much shorter than those of the male, the front tibiæ slender and curving outwards, with the extremity broad and four-lobed.

♂. The *head* is dull, rather finely and evenly punctured, a little depressed in the middle and slightly dilated on each side behind the eye. The mandibles are short and thick, rounded externally, with the tips inclined upwards and hollowed internally, with the lower edge serrate. The *pronotum* is

entirely punctured and opaque, especially at the sides. The *elytra* are finely and closely punctured. The front *tibia* is straight, slender, and rather narrowly forked at the end.

Variation of the male. In small specimens the head and pronotum are closely and fairly strongly punctured and the sides of the latter densely and rugosely. The mandibles are shorter than the head and the upward curvature is not strong. In fairly large males the mandibles are about as long as the head and strongly bent upwards, with the lower edges meeting except at the base. The punctures of the head and pronotum are fine and not very close.

♂. *Length* (with mandibles), 12–20 mm.; (without mandibles) 11–14 mm. : *breadth*, 4·5–7·5 mm.

♀. *Length*, 15·5 mm. ; *breadth*, 7 mm.

BOMBAY PRES. : N. Kanara (*T. R. D. Bell*, July) ; Poona (*Hope collection*).

Type in the Hope Dept., Oxford University Museum.

50. **Dorcus spencei.** (Plate IX, figs. 5, 6.)

Lucanus spencei Hope,* Trans. Linn. Soc. xviii, 1841, p. 589 ; Hope & Westw., Cat. Luc. Col. 1845, p. 19.
Prosopocœlus spencei Boil., Trans. Ent. Soc. Lond. 1913, p. 233.
Dorcus spencei Arrow, Trans. Ent. Soc. Lond. lxxxvi, 1937, p. 242, pl. 2, fig. 1.
Prosopocœlus crenicollis Thoms.,* Ann. Soc. Ent. France (4), ii, 1862, p. 418 ; Boil., Trans. Ent. Soc. Lond. 1913, p. 232.
Prosopocœlus mordax Boil., Le Naturaliste, 1904, p. 285.
Prosopocœlus laticeps Moll.,* Insektenbörse, xxi, 1904, p. 402.

Deep chocolate-brown, with the greater part of the head and mandibles, the antennæ and tarsi black, the femora rather bright-red. Elongate, very convex and moderately shining above. The club-joints of the antenna are moderately long and the seventh joint almost the same length. The prosternal process strong, compressed and right-angled.

♂. The *head* is broad and flat, finely and densely granular and opaque, the canthus rounded in front, extending past the middle of the eye and rather prominent laterally at the end. The front margin is excised and the clypeal process minute, simple and tongue-shaped. The *pronotum* is finely coriaceous but rather shining, except at the sides, which are densely granular and opaque. The front angles are truncate, the lateral margins roughly serrate and nearly straight to beyond the middle, where there is a sharp spine, and concave from there to the hind angles, which are rounded. The *elytra* are also coriaceous, moderately shining dorsally and dull at the sides. The *mentum* is hollowed and the front edge of the submentum is not sharply carinate nor trilobed. The front *tibia* is finely serrate externally, with strong sharp lateral teeth, and the middle and hind tibiæ have each a strong lateral spine.

Variation of the male. In a small example (*crenicollis* Thoms., type) the mandibles are of rather triangular shape and the inner edge is finely and closely serrate beneath almost from base to apex, with a single small basal tooth on a higher level. In a larger male (the type of *laticeps* Moll.) the gap between the basal tooth and the serrate edge is wider, there is a large rounded basal lobe externally, a ridge extends from the basal tooth to near the tip upon the upper face and the anterior half of the mandible curves upward. The type of *spencei* Hope represents the very different constant phase, of which it is the only known specimen. In this the mandibles are slender, twice as long as the head, strongly and evenly rounded, forked at the tip and smooth, with a single small tooth at the inner edge a little distance from the base.

The female is unknown to me.

♂. *Length* (with mandibles), 31–44 mm.; (without mandibles) 25–36 mm.: *breadth*, 10·5–15 mm.

Assam: Shillong, Khasi Hills. Burma: Myitkyina (*Po Yone*, November); Nam Tamai Valley, 3000 ft. (*R. Kaulback*, August).

Type of *D. spencei* in the Hope Dept., Oxford, those of *crenicollis* and *laticeps* in the Oberthür collection, that of *mordax* in Dr. Didier's collection.

D. spencei is closely related to *D. bulbosus* but, in the normal (variable) phase, the mandibles are broader, with the inner edges meeting for almost their entire length, and, in the constant phase, the erect tooth found upon the mandible of the corresponding phase of *D. bulbosus* is absent. The line joining the submentum and mentum is without the prominent lobe seen there in large males of *D. bulbosus*.

51. **Dorcus bulbosus.** (Plate X, figs. 3, 4.)

Lucanus bulbosus Hope,* Trans. Linn. Soc. xviii, 1841, p. 589, pl. 11, fig. 2: Parry, Trans. Ent. Soc. Lond. 1870, p. 84.
Prosopocœlus bulbosus Boil., Trans. Ent. Soc. Lond. 1913, p. 229.
Lucanus punctiger Hope, Trans. Linn. Soc. xviii, 1841, p. 592.

Dark chocolate-brown, with the femora of the male red. Rather narrowly elongate, with the head broad in the male. The lateral edges of the pronotum finely serrate, with a spiniform lateral angle far behind the middle, and rather concave from the angle to the blunt hind angle. The prosternum right-angled, rather compressed and not produced behind.

♀. Long and narrow, with the pronotum and the scutellar region and suture of the elytra shining. The *head* is strongly and closely rugose. The *pronotum* is finely punctured in the middle, broadly, strongly and closely at the sides. The *scutellum* is well punctured. The *elytra* bear a line of close

punctures adjoining the suture and a double line at a little distance from it and are densely punctured except behind the scutellum and along the sutural margin. The *mentum* is coarsely rugose. The *metasternum* and *abdomen* are shining, with the sides rather strongly punctured. The front *tibia* is forked at the end and not very stout and the middle and hind tibiæ are armed with a strong lateral spine.

♂. Rather narrow and tapering behind, with broad head and prothorax, the surface rather dull above and beneath. The *head* is flat, finely and densely granular, very broad in front, with the front angles rounded, the eyes rather small, the canthus extending past the middle but not prominent, the sides contracted behind the eyes. The clypeal process consists only of a short blunt tubercle and is extremely small. The *pronotum* is broad in front, finely and densely granular and opaque at the sides, very lightly in the middle, with the front angles rounded, the lateral margins feebly curved to the sharply spiniform lateral angle. The *elytra* are finely coriaceous and dull, except in the sutural region, the anterior part closely and finely punctured, the sides entirely opaque, the lateral margins a little flattened, the apices rather narrowed. The *mentum* is a little hollowed and bears scattered punctures. The lower surface is dull, with a few punctures at the sides of the *metasternum* and *abdomen*. The terminal fork of the front *tibia* is strongly deflexed, the middle tibia has a strong lateral spine and the hind tibia a minute one.

Variation of the male.—Variable phase. The mandibles are a little longer than the head. Small examples have the upper surface very dull and not very convex. With increasing size the surface, especially of the pronotum, becomes very convex and less dull in the middle. The mandibles are almost straight externally and bear rounded, bead-like teeth at the inner edge. In the smallest specimens there is only a very small gap at the base between the closed mandibles. This gap becomes progressively larger until only the anterior halves are in contact but otherwise little change occurs even in full-sized specimens, although the head is relatively much broader.

Constant phase. The mandibles are slender, gently curved, a little compressed laterally, smooth internally and externally, with a small rounded basal process internally and a strong erect curved and pointed process at the middle of the upper edge. The tips are bifid.

♂. *Length* (with mandibles), 28–39 mm.; (without mandible 24–32 mm. : *breadth*, 10–14 mm.

♀. *Length*, 22 mm. ; *breadth*, 9 mm.

Assam : Khasi Hills, Shillong ; Garo Hills, above Tura 3500–3900 ft. (*S. Kemp*, July, Aug.).

Type in the Hope Dept., Oxford.

D. bulbosus has the closest resemblance to *D. polymorphus* but the males can be separated without difficulty by the difference in the minute clypeal process.

52. Dorcus perplexus.

Cladognathus perplexus Parry,* Proc. Ent. Soc. Lond. 1862, p. 111; Trans. Ent. Soc. Lond. 1864, p. 26; *op. cit.* 1870, p. 82.

♂. Very dark brown, with the head and the sutural region of the elytra black or chestnut-red, with the antennæ and tarsi black, the mandibles and tibiæ dark red, and the outer margins of the head, pronotum and elytra, as well as the sutural margins of the last, more or less darkened. Elongate in shape and dull above and beneath except in the region of the elytral suture. The *head* is densely granular, flat, with a strong curvilinear emargination in front, the clypeal process very small, simple and tongue-like. The front angles of the head are obtuse, the sides oblique in front and feebly angulate behind the eyes. The mandibles are triangular, with the outer margin a little concave, the inner edge nearly straight, with strong blunt serrations almost from base to tip. The *pronotum* is finely and densely granular, very opaque at the sides but less so in the middle. The front angles are blunt, the lateral margins not serrate, gently rounded in front, obtusely angulate behind the middle and straight from there to the rounded hind angles. The *scutellum* is finely punctured. The *elytra* are closely and minutely punctured and opaque except near the suture. The *prosternal* process is vertical in front and a little compressed. The *legs* are fairly slender, the front tibia finely serrate externally and with very minute teeth, the terminal fork short, the middle tibia with a minute lateral spine, the hind tibia without spine.

Length (with mandibles), 25–27 mm.; (without mandibles) 20–23 mm.: *breadth*, 9–10 mm.

"INDIA."

Type in the Oberthür collection.

Only specimens of small size are at present known of this species but it is probable that a higher degree of development will be found to occur. Parry has mentioned female specimens in the British Museum but I have found none that can be referred with any certainty to *D. perplexus*. The above description is taken from the unique male type and a rather larger but otherwise exactly similar male in the British Museum. The exact habitat of both is unknown, but the latter is from the East India Company's collection. The species may prove to be Indo-Chinese, as a female specimen perhaps belonging to it has been sent to me from Tonkin by M. de Cooman.

A large dark brown male specimen from Laos, Tonkin, in Mr. Bernard Benesh's collection, resembling rather closely the large ♂ *D. buddka* Hope (Pl. 15, fig. 8) but with dull, not glossy, elytra, very likely belongs to this species.

53. **Dorcus polymorphus,** nom. n. (Plate II, figs. 5*a*, *b*, *c*; Plate IX, figs. 1, 2.)

Prosopocœlus parryi Boil., Trans. Ent. Soc. Lond. 1913, p. 233 (pre-occupied name).
Lucanus bulbosus Hope & Westw.,* Cat. Luc. Col. 1845, p. 20 (not *Lucanus bulbosus* Hope, 1841).
Dorcus parryi Arrow, Trans. R. Ent. Soc. Lond. lxxxvi, 1937, p. 242, pl. 2, fig. 3.
Prosopocœlus parryi vars. *latus*, *angustus* Did., Col. Luc. du Globe, 1929, pp. 98–101, figs. 50–53.

The female is black or almost black, the male deep red or reddish-black, with the mandibles and sides of the head black, the femora and tibiæ sometimes bright red and the tarsi bearing conspicuous pads of bright yellow hairs beneath. The shape rather narrow and the lateral margins of the pronotum are finely serrate. The prosternum bluntly produced behind. The eyes small and the canthus extending past the middle.

♀. The upper surface is strongly punctured, rugosely at the sides, but very shining in the median part of the pronotum and close to the elytral suture. The *head* is coarsely rugose and sometimes shows an ill-defined shining elevation on each side of the middle. The *pronotum* is finely punctured, sometimes with a narrow smooth median line, the sides very strongly and rugosely punctured. The *elytra* are very closely punctured except near the suture, where they are very shining, and the punctures are very strong and dense at the sides. The front *tibia* is broadly forked at the end.

♂. The pronotum and elytra are feebly shining along the middle line. The *head* is densely granular and opaque, short and broad, with the front angles rounded and the cheeks very slightly swollen behind the eyes. The front margin is curvilinearly excised and the clypeal process is small and bilobed. The *pronotum* is very finely coriaceous, densely at the sides, less so and feebly shining in the middle. The front angles are very bluntly rounded, the lateral margins evenly rounded to beyond the middle, where there is an acute spine, and concave to the broadly rounded hind angles. The *elytra* are closely and very minutely punctured and feebly shining dorsally, densely coriaceous and opaque at the sides. The *mentum* is hollowed and the front edge of the submentum is sharply carinate and more or less trilobed. The front *tibia* is strongly forked at the end, the middle tibia has a strong lateral spine and the hind tibia a feeble one. The extremities

of the four posterior tibiæ internally, as well as the lower surface of the tarsal joints, bear conspicuous pads of bright yellow hairs.

Variation of the male. In the ordinary form of male the mandibles are of the priodont type, about as long as the head, triangular in shape and toothed almost from base to tip. In small specimens the outer edge is gently rounded, in larger ones it is straight or slightly concave and the first two teeth of the inner edge are large and bead-like, with a gap between them. There is a ridge upon the upper surface and in large specimens this forms a prominent lobe at the base of the mandible. Large males may have another (constant) form of mandible, evenly curved and fairly slender, with a strong erect tooth before the middle of the upper surface, a rounded basal tooth at the inner edge and two or three small blunt teeth before the extremity, which is bifurcated. This phase occurs together with the normal one, but is comparatively rare. I have figured (Pl. II, fig. 5 *b*) a remarkable specimen in which the two mandibles are of the two different forms.

♂. *Length* (with mandibles), 22–40 mm.; (without mandibles) 19–33 mm.: *breadth*, 8–14 mm.

♀. *Length*, 20–25 mm.; *breadth*, 8–10 mm.

Darjeeling Distr.: Mangpu, 5000 ft. (*S. W. Kemp*, April, May); Pedong (*A. Desgodins*); Pankassari, Kalimpong (Aug.).

Type in the Hope Dept., Oxford University Museum.

This species, wrongly described as *bulbosus* in Hope and Westwood's Catalogue, was renamed *parryi* by Boileau but, since that name had been previously applied to other species of *Dorcus*, it is necessary to find yet another name for it. The ordinary males bear a very close resemblance to those of the true *bulbosus* but the clypeal process, though minute, has quite a different shape and the head is a little dilated and not contracted behind the eyes.

54. **Dorcus dentifer.** (Plate XII, fig. 6.)

Cladognathus dentifer Deyr.,* Ann. Soc. Ent. Belg. ix, 1865, p. 29, pl. 1, fig. 5.

Prosopocœlus parallelus Did.,* Luc. du Globe, 1931, p. 231 (new syn.).

Black, smooth and shining beneath and upon the pronotum and the sutural margins of the elytra, the remainder of the elytra densely punctured. The lateral edges of the pronotum finely serrate, a very deep front marginal groove except in the middle, and the front angles fairly sharp. The shoulders of the elytra acute. The prosternum compressed behind, rectangular and not produced; the metasternum coarsely punctured at the sides.

♀ (probable). Narrowly elongate. The *head* is strongly but

not densely punctured, with a smooth shining area in the middle behind the eyes. The *pronotum* is entirely punctured, moderately finely in the middle, more strongly at the sides, very closely at the lateral margins. The sides are rounded in front, then parallel to the lateral angles and strongly concave to the well-marked hind angles. The *scutellum* bears a few punctures. The *elytra* are densely punctured, but rather less densely in front and finely and sparingly upon the sutural margin, which is rather elevated. There is a double line of close punctures upon the anterior part of the elytron at a little distance from the suture. The *mentum* is very coarsely rugose. The front *tibia* is fairly long, forked at the end, and the four posterior tibiæ have each a strong lateral spine.

♂. Moderately elongate, not very convex. The *head* is broad, flat, densely granular and opaque, with large scattered shallow punctures. The front margin is nearly straight, the clypeal process very small, two-cusped, the front angles rounded, the canthus narrow and not prominent, the cheeks gently rounded. The mandibles are short (about as long as the head), far apart at the base, gently curved, laterally compressed, bluntly and irregularly toothed internally, with a moderately long tooth, inclined inwards, at the middle of the upper edge. The *pronotum* is very smooth and shining with very fine scattered punctures, except at the sides and base, where they are large and close. The lateral edges are almost straight to beyond the middle, the lateral angles are very sharp, and from there the sides are gently concave to the rounded hind angles. The *scutellum* is strongly punctured. Except upon the sparingly punctured sutural margins, the *elytra* are very closely punctured, but less densely than in the female, and they are shining, except at the sides, where the puncturation is dense. The *mentum* is strongly punctured. The front *tibia* is slender, the middle tibia has a strong lateral spine, the hind tibia a very minute one.

Variation of the male unknown. The form of the mandible in the two known male specimens apparently indicates the fully developed condition.

♂. *Length* (with mandibles), 24 mm.; (without mandibles) 19 mm.: *breadth*, 8 mm.

♀. *Length*, 20 mm.; *breadth*, 8 mm.

Bombay: North Kanara (*T. R. D. Bell*).

Type in René Oberthür collection; that of *parallelus* Did. in the British Museum.

The locality recorded above is that of a female specimen which I believe to belong to the species. Neither of the two known males has any precise locality. (Dr. Didier regards a female from Tenasserim in the British Museum as belonging to *D. parallelus*, but I cannot agree with his view.)

55. **Dorcus jenkinsi.** (Plate X, fig. 8.)

Lucanus jenkinsi Westw.,* Cab. of Oriental Ent. 1848, p. 21, pl. 10, fig. 3.
Metopodontus jenkinsi Boil., Trans. Ent. Soc. Lond. 1913, p. 225.
Metopodontus (subg. *Hoplitocranum*) *calcaratus* Jakowl., Horæ Soc. Ent. Ross. xxx, 1896, p. 172.

Deep chestnut-red, with the front margin of the pronotum, the scutellum, the inner and outer margins of the elytra, the knees, tarsi and antennæ black, the dark front margin of the pronotum dilated in the middle, the black sutural stripe of the elytra very broad in the female. The shape narrowly elongate, the male entirely opaque above and the female very glossy except upon the head and the lateral margins of the pronotum and elytra. The seventh joint of the antenna sharply produced. The front tibia very finely serrate externally. The prosternum forms a very short rounded keel behind the front coxæ.

♀. Very shining above, except upon the head and lateral margins of the pronotum and elytra. Deep red-brown, with the outer margins, the scutellum, a large triangular median patch upon the pronotum and a broad sutural band upon the elytra, dilated at the base and not reaching the extremities, black. The *head* is coarsely rugose, the mandibles not broad and bearing a very strong internal tooth. The *pronotum* is very strongly and closely punctured at the sides, more sparingly but very distinctly in the middle. The lateral margins are serrate and gently curved to the lateral angulation, which is rather sharp, and nearly straight to the very obtuse hind angle. The *elytra* are very finely punctured in the dorsal part and strongly and very densely at the sides and apices, without being opaque there. The front *tibia* is a little curved, minutely serrate externally, with two or three slightly larger teeth, and produced at the extremity, which is palmate, with four very short blunt lobes.

♂. The *head* is densely granular and bears four tubercles placed in a transverse line along the middle. Behind these it is convex and in front of them a little depressed. The front angles of the head are blunt and the cheeks a little swollen. The clypeal process is trilobed in front. The mandibles are long and slender. The *pronotum* is very finely and densely granular, the front angles are blunt; the sides almost straight to the lateral angle, which is acutely prominent and situated only a little in front of the base, and then almost straight to the base, the hind angle extremely blunt. The *scutellum* is very finely granular. The *elytra* are densely punctured in the sutural region and finely coriaceous upon the remaining surface. The shoulders are acute and the apices a little produced. The tip of the *abdomen* has a compressed and

pointed process beneath, which bears a tuft of short yellow hairs. The *legs* are very slender, the front tibia rather feebly forked at the extremity, the middle tibia bearing an extremely minute lateral spine and the hind tibia without spine but with a small terminal process bearing internally a tuft of short yellow hairs.

Variation of the male. The four cephalic tubercles are absent in small specimens and the mandibles are straight to beyond the middle and then gently curved, the inner edge serrate basally, with two small obliquely placed teeth before the tip. A medium-sized male shows only a rather blunt tooth a little before the base and two prominent oblique teeth before the tip. Well-developed specimens have very long mandibles, the basal tooth is sharp and situated at about a third of the length from the base and the tip is very slender and sharp.

♂. *Length* (with mandibles), 23–39 mm.; (without mandibles) 19–23 mm.: *breadth*, 8–10 mm.

♀. *Length*, 18·5 mm.; *breadth*, 7·5 mm.

Bombay: Yellapur, N. Kanara (*T. R. D. Bell*, June). Assam: Bhanugach R., Sylhet (Sept.). Burma: Karen Hills, 2700–3300 ft. (*L. Fea*, Dec.); Panchai Res., Namtu (June).

Type in the Hope Dept., Oxford University Museum.

The tufts of yellow hair at the extremities of the abdomen and hind tibiæ seem to be distinctive of the males of this species alone.

56. **Dorcus macclellandi.** (Plate X, figs. 6, 7.)

Lucanus McClellandi Hope,* Proc. Ent. Soc. Lond. 1842, p. 83; Trans. Ent. Soc. Lond. iv, 1845, p. 74.

Metopodontus (Hoplitocranum) macclellandi Boil., Trans. Ent. Soc. Lond. 1913, p. 225.

Cladognathus quadrinodosus Parry,* Proc. Ent. Soc. Lond. 1863, p. 109; Trans. Ent. Soc. Lond. 1864, p. 22, pl. 8, fig. 4.

Deep red or chocolate, with the antennæ, tarsi, knees, the front of the head and the margins of the thorax and elytra darker, the tarsi with conspicuous pads of bright yellow hair The male entirely opaque above, the female shining except at the sides, with a broad dark sutural stripe. The prosternum very short and rounded behind.

♀. Rather bright chestnut-red, with the scutellum and a broad sutural stripe upon the elytra black and shining. The *head* is rugose in front and coarsely punctured behind, with a small smooth median posterior space. The *pronotum* is shining but well punctured, the punctures moderately fine in the middle, becoming progressively stronger to the sides, where they are very coarse and close. The lateral edges are finely serrate and gently rounded from the front angles, which are fairly sharp, to the acute lateral angles and feebly concave

from there to the obtuse hind angles. The *elytra* are shining in the inner half, where they bear numerous rather fine but deep punctures, coarsely and densely punctured on the outer half, and the apices rugose. The lower surface is very finely and sparsely punctured except the middle of the *metasternum* and the last ventral sternite, which are coarsely and closely punctured. The front *tibia* is slender and slightly curved, its extremity palmate, with several very short blunt lobes; the middle and hind tibiæ have each a sharp lateral spine.

♂. Red or chocolate, with the femora and tibiæ brighter red. Long and narrow, with very slender legs, the upper surface entirely opaque except close to the suture. The *head* and pronotum are finely and densely granular, the front angles of the head obtuse, the sides gently rounded behind the eyes. The clypeal process is small, quadrate and rather tridentate in front. The mandibles are slender. The front angles of the *pronotum* are produced but blunt, the sides almost straight to far beyond the middle, where they are sharply angular, and feebly excised from there to the very blunt hind angles. The *elytra* are smooth and finely punctured near the suture and very densely confluently punctured elsewhere. The shoulders are acutely angular. The *abdomen* is smooth and has at its extremity a longitudinal ridge ending in a tufted process. The front *tibia* is minutely serrate and feebly toothed externally, with a fine terminal fork, and the middle and hind tibiæ are without lateral spine.

Variation of the male. In small specimens the head is simply convex, with fairly numerous distinct punctures, the basal half of the mandible straight and serrate internally, the terminal half gently curved. In larger specimens, in addition to the basal serration, there are two or three teeth towards the tip. Indications also appear of four transversely placed tubercles upon the vertex of the head. Moderately larger males have two very small but sharply-elevated tubercles, with two very feeble ones between them, the mandibles are about as long as the elytra and gently curved, with a short stout tooth a little beyond the base, a minute one before the apex and just before the latter, a short lamina, a little produced at the distal end.

Specimens from Assam are brighter red than those from the Darjeeling district, and the largest males are longer, they have four strong cephalic tubercles and the mandibles are very long, with a strong sharp tooth placed at a right angle about one third from the base, a smaller tooth at nearly two-thirds of the length, followed by a short laminar process and a flat triangular tooth between this and the tip.

♂. *Length* (with mandibles), 19–40 mm.; (without mandibles), 16–25 mm.; *breadth*, 7–10 mm.

♀. *Length*, 18 mm.; *breadth*, 7 mm.

DARJEELING DISTR.: Pedong, Maria Basti (*L. Durel*). ASSAM: Sadiya (*T. Bainbrigge Fletcher*, May); Dejoo, N. Lakhimpur, base of hills (*H. Stevens*, Aug.).

Type in the Hope Dept., Oxford University Museum: type of *quadrinodosus* Parry in the Oberthür collection, co-type in the British Museum.

57. **Dorcus passaloides.** (Plate X, fig. 5.)

Lucanus passaloides Hope & Westw.,* Cat. Luc. Col. 1845, p. 24.
Hemisodorcus passaloides Parry, Trans. Ent. Soc. 1864, p. 44, pl. 10, fig. 4.
? *Prosopocœlus tigrinus* Did., Luc. du Globe, 1928, p. 72, fig. 27.

Dull chocolate-brown, with an inconspicuous clothing, especially at the sides of the elytra, of minute erect setæ, the tibiæ and tarsi conspicuously fringed with pale yellow hair. Narrow, parallel-sided. The eyes moderately large. The front angles of the pronotum strongly but bluntly produced, the sides parallel, rather straight to far beyond the middle, where they are sharply but not acutely angulate, and straight from there to the very obtuse hind angles. The prosternum not elevated behind but broad and flat.

♀. Moderately shining. The *head* is strongly and closely punctured, the eyes almost divided by the canthus, which is fairly prominent laterally. The *pronotum* is strongly and closely and rather evenly punctured, but a little less strongly, and closely in the anterior dorsal part than elsewhere. The *elytra* are very deeply striate, the striæ closely punctured and the intervals narrow, shining and unequal, but with a broad, very irregularly punctured interval next to the sutural one. The sides and apices are very closely punctured and setose. The *abdomen* is strongly punctured and shining. The front *tibia* is stout, and has a short terminal fork. The middle and hind tibia have each a strong lateral spine.

♂. Narrowly elongate, with rather slender legs. The surface is dull. The *head* is moderately long, the front angles very blunt, the canthus extending past the middle of the eye, the sides gently rounded behind the eye. The sides of the head are strongly punctured, the middle generally very sparsely punctured. The clypeal process is very short and trilobed. The *pronotum* is short, closely punctured at the sides and usually over the whole surface. The *elytra* are finely and densely reticulate-punctate, with slight indications of longitudinal striæ, and the shoulders are sharply angulate. The *abdomen* is strongly punctured and shining at the sides and the last sternite is closely setose. The front *tibia* has a narrow terminal fork, the middle tibia a small lateral spine and the hind tibia none or only a very minute one.

Variation of the male. In small males the head and pronotum are closely punctured, the head dull, the pronotum rather shining. The mandibles are short and irregularly toothed almost to the base, where they are rather broad. In larger specimens the head and pronotum are entirely opaque, very closely punctured at the sides, but finely and sparsely in the middle. The mandibles are fairly long and straight, still with irregular teeth from near the base to near the tip. The largest specimens have head and pronotum very finely and sparingly punctured except close to the lateral margins, and the mandibles are about 1½ times as long as the head, straight with strongly curved tips, the teeth very irregular and feeble, except the first close to the base and the last just before the curved tip.

♂. *Length* (with mandibles), 16–27 mm.; (without mandibles) 14–20 mm.: *breadth*, 5–8 mm.

♀. *Length*, 15–19 mm.; *breadth*, 6–7 mm.

ANDAMAN IS. MALAY PENINSULA. BORNEO. SUMATRA. JAVA.

Type in the Hope Dept., Oxford University Museum.

This is a common and widely distributed Malayan insect. The single Bornean specimen, called *tigrinus* by Dr. Didier, will very likely prove to be the same.

58. **Dorcus boreli.** (Plate X, fig. 11.)

Prosopocœlus boreli Boil., Le Naturaliste, xxvi, 1904, p. 284.

♂. Black, or blackish-brown with the head and pronotum black, the tarsi clothed beneath with fairly long yellow hairs. Narrowly elongate, with slender legs. Entirely opaque above and almost entirely beneath. The prosternal process is vertical in front and rather bluntly pointed. The seventh joint of the antenna is acutely produced and the three club-joints are rather short. The anterior part of the *head* slopes obliquely but without a sharp carina at its upper edge. The front angles are rounded and the sides of the head are very feebly swollen behind the eyes. The clypeal process is small and bluntly triangular. The mandibles are rather longer than the head, gently and evenly curved externally, minutely bifurcate at the end, with a fairly broad, blunt tooth at the base, a small blunt one before the middle and a still smaller one between the last and the tip. The *pronotum* is short and broad and entirely coriaceous. The front angles are produced but not very sharp, the sides evenly rounded from the front angles to the acutely spined lateral angles and sinuate from there to the obtuse but well-marked hind angles. The base is straight and very narrow. The *scutellum* and *elytra* are coriaceous, the latter narrow but much broader at the shoulders

than the base of the pronotum. The front *tibia* is very finely serrate externally, with a few small, sharp, widely separate teeth, the middle tibia bears a strong lateral spine and the hind tibia has a very minute spine or none.

Length (with mandibles), 26–29 mm.; (without mandibles) 22–24·5 mm.: *breadth*, 8–9 mm.

ASSAM.

♀. Unknown.

Type in Dr. Didier's collection.

59. **Dorcus feai.** (Plate X, figs. 9, 10.)

Prosopocœlus feai Boil.,* Le Naturaliste, xxiv, 1902, p. 204.

Reddish-chocolate, with the margins of head, pronotum and elytra and sometimes the entire head or the head and thorax black, or (♀) the whole insect black, the lower surface of the tarsi and the inner face of the tibiæ bearing fringes of rather long golden-yellow hairs. The prosternum prominent behind but rather broad and bluntly rounded. The seventh joint of the antenna acutely produced and the three joints of the club short.

♀. Entirely black and shining, fairly narrow but less slender than the male. The *head* is closely rugose in front and strongly and closely punctured behind. The *pronotum* is almost imperceptibly punctured in the middle but the punctures become gradually stronger and more numerous towards the sides and form wide, strongly and very closely punctured, borders. The *scutellum* is well punctured. The *elytra* are everywhere distinctly and rather closely punctured, with a deep juxta-sutural stria, disappearing towards the apex, and traces of paired lateral striæ. The elytral punctures become gradually stronger and closer from suture to sides but without forming opaque borders. The front *tibia* has a fairly long but not slender terminal fork and the middle and hind tibiæ have each a strong lateral spine.

♂. Rather narrowly elongate, but with the prothorax short and broad. The upper surface is dull, but in small specimens parts of the head, the middle of the pronotum and the sutural region of the elytra are shining. The *head* is flat and finely coriaceous. The ocular canthus extends to the middle of the eye, but is very obtusely angular in front and not prominent laterally. The sides of the head are feebly swollen behind the eyes. The clypeal process is small, rather narrow and obtusely pointed. The mandibles are long, slender and gently curved. The front angles of the *pronotum* are produced but very blunt, the sides are gently rounded to the sharply spined lateral angles, which are placed only a little in front of the base, and feebly sinuated to the latter, the hind angle very obtuse.

The *elytra* are long and narrow, with the surface finely coriaceous, except in the inner part, where they are minutely and closely punctured. The sides are feebly rounded and the shoulders acutely spinose. The *legs* are very slender, the front tibia strongly produced beyond the point of insertion of the tarsus, the middle and hind tibiæ with close yellow fringes at the inner edge, the former bearing a fine lateral spine, the latter with none or only a vestige. The tarsi are very long and clothed with long yellow hairs beneath.

Variation of the male. In a very small specimen in the Genoa Museum the head and pronotum are finely, not closely, punctured and the mandibles flat, simple at the tip and serrate at the inner edge. In larger examples the entire upper surface is dull and finely granular and the mandibles are slender, not flat, and bifid at the tip. One of moderate size in the British Museum has numerous short teeth at irregular intervals along the mandible and a small double tooth near the base. The large male type in the Genoa Museum has a single basal tooth and three similar ones only in the outer half of the mandible.

♂. *Length* (with mandibles), 17–40 mm.; (without mandibles) 13–28 mm.: *breadth*, 6–11 mm.

♀. *Length*, 21–24 mm.; *breadth*, 8–10 mm.

BURMA: Cheba, Karen Hills, 2700–3300 ft. (*L. Fea*, Dec.).

Type in the Genoa Museum; co-type in the British Museum. The female closely resembles that of *D. cilipes* Th., but the pronotum and elytra are smoother and the sides of the former less broadly punctured.

60. **Dorcus cilipes.** (Plate X, fig. 12.)

Cladognathus cilipes Thoms.,* Ann. Soc. Ent. France (4), ii, 1862, p. 416.

Black or very dark chocolate-brown, the tarsi clothed with rather long yellow hairs beneath. Rather elongate and not very convex, the upper surface opaque or dull in the male, feebly shining in the female. The prosternum prominent behind, but rounded and little compressed. The three joints of the antennal club short and the seventh joint strongly and sharply produced. The middle and hind tibiæ have each a sharp lateral spine.

♀. Black, with the upper surface feebly shining. The *head* is rugosely punctured, the canthus almost dividing the eye and slightly prominent laterally. The *pronotum* is very minutely and sparsely punctured in the middle and very coarsely and closely at the sides. The front angles are produced, the sides feebly rounded to the sharp lateral angle and almost straight to the base. The *elytra* are entirely punctured, minutely in the inner anterior region, strongly and closely

at the base, the outer and posterior parts. The front *tibia* is broad, strongly toothed laterally and shortly bilobed at the end.

♂. Long and narrow, with very slender legs, the upper surface opaque. The *head* and pronotum are finely and densely granular, the front angles of the head are very obtuse, the canthus narrow, extending to about the middle of the eye, the head produced behind and gently rounded behind the eye. The front angles of the *pronotum* are produced, the sides gently rounded to far beyond the middle, where they are acutely angulate, and slightly concave to the blunt hind angles. The *elytra* are entirely opaque and the shoulders are acutely angular. The front *tibia* is slender, finely toothed externally, narrowly forked at the extremity, and is tufted beneath at its inner extremity.

Variation of the male. Small specimens are redder in colour and the upper surface is less dull than in larger ones. The head, pronotum and elytra are also distinctly and finely punctured, the elytra rather strongly and densely in the anterior part. The mandibles in the smallest specimens are as long as the head and feebly serrate internally from the base almost to the apex. In larger examples the teeth are stronger, the basal one broad, the last a little detached from the rest. Well-developed males have the mandibles twice as long as the head, gently and evenly rounded, the teeth unevenly spaced, the basal one bifid and the apex shortly and equally forked.

♂. *Length* (with mandibles), 20–39 mm.; (without mandibles) 17–28 mm.: *breadth*, 7–11 mm.

♀. *Length*, 22–26 mm.; *breadth*, 9–10 mm.

Assam: Naga Hills (*W. Doherty*); Khasi Hills, Sylhet, Shillong; Manipur (*W. Doherty*).

Type in the René Oberthür collection.

61 **Dorcus histrio.** (Plate XI, fig. 16.)

Dorcus histrio Arrow,* Trans. R. Ent. Soc. Lond. lxxxiii, 1935, p. 109, pl. 6, fig. 4; Ann. Mag. Nat. Hist. (11) ii, 1938, p. 54.

Head, lower surface and legs dark reddish-black, the sides of the metasternum anteriorly marked with a triangular orange patch; the pronotum of the male bright yellow, with three longitudinal black stripes, the elytra yellow, with a black sutural stripe; the female with bright yellow elytra, decorated with a large common black triangle extending from the shoulders to the end of the suture. The prosternum prominent behind but not pointed.

♀. The body is oval and convex, not long, glossy above and beneath. The head and pronotum are dark, the latter with three rather indefinite reddish marks on each side, the

elytra bright yellow, with narrow black outer margins and a large black inverted triangle extending from the base to the apex. The *head* is very coarsely and rugosely punctured, the eyes small, with the canthus reaching beyond the middle. The *pronotum* is very finely and sparsely punctured in the middle, very strongly but not densely at the sides, the lateral margins are gently rounded to past the middle, where they are obtusely angled, and feebly concave to the blunt hind angles. The *scutellum* bears a few punctures. The *elytra* are finely but distinctly punctured, the sides rather more strongly and closely and the apices rugosely. The *mentum* is coarsely rugose, the *metasternum* unevenly, not closely, punctured, the *abdomen* very sparsely and minutely, except the first and last sternites, which are strongly punctured. The front *tibia* ends in four short blunt lobes.

♂. The head, mandibles, lower surface and legs are brownish-black and the pronotum and elytra bright yellow, with the extreme edges black and with three irregular black longitudinal stripes upon the pronotum and a regular stripe, common to both elytra, which tapers a little before the apex. There is also a triangular yellow patch on each side of the metasternum anteriorly. The body is elongate and not very convex, the surface dull above and beneath and only a little more shining near the elytral suture. The *head* and pronotum are very finely and densely granular, the head is rather convex and has two slightly indicated elevations near the middle, the front angles are obtuse, the eyes small, with a very narrow canthus extending to the middle, the head a little produced behind the eyes and rounded behind them at the sides. The clypeal process is narrow and feebly bilobed at the end. The mandibles are slender, straight from the base to within a short distance of the tip, where they are evenly curved, the inner edge serrate for nearly the whole length but with a small single tooth a short distance from the tip. The front angles of the *pronotum* are produced and blunt, the lateral margins gently curved to the lateral angles, which are sharp, and concave to the well-marked hind angles. The *elytra* are densely punctured, the apical part more coriaceous, the shoulders sharply angular. The mentum is granular, the metasternum feebly punctured and the abdomen almost unpunctured. The legs are slender, the front tibia with a minutely serrate outer edge and feeble teeth, the terminal fork not strong, and the middle and hind tibiæ are without lateral spines.

♂. *Length* (with mandibles), 25–27 mm.; (without mandibles) 20–21 mm.: *breadth*, 8·5 mm.

♀. *Length*, 18 mm.; *breadth*, 7·5 mm.

S. India: Periambadi Ghat, Coorg (May); Kumali Hill

(*K. Govindaraj*, April); Pirmaid, Travancore, 3000 ft. (*Mrs. R. Imray*).

Type in the British Museum.

I have seen only two males and one female of this species. It is possible that the mandibles of the male reach a higher degree of development than that described above.

62. **Dorcus speciosus.** (Plate XI, figs. 4, 5.)

Metopodontus speciosus Boil.,* Le Naturaliste, 1904, p. 278.

Black or dark blackish-brown, with the sides of the elytra (very broadly in the male, more narrowly in the female) bright yellow, except the extreme edges, which are black, an oval yellow spot on each side of the metasternum in both sexes and, in the male, the sides of the pronotum more or less pale. The eyes rather prominent, the pronotum short, its sides feebly curved to far beyond the middle and then strongly rounded, without distinct lateral or basal angle. The prosternum strongly compressed and acutely produced behind. The club-joints of the antenna fairly long and the seventh joint produced into a long slender process. The outer edge of the front tibia very finely serrate and almost without larger teeth.

♀. Black, very glossy above, each elytron with a bright yellow lateral band not quite reaching the shoulder in front or the suture behind. The shape is rather narrowly oval. The *head* is rugosely punctured, the mandibles small and narrow. The *pronotum* and *elytra* are very shining, sparingly punctured dorsally and closely at the sides. The shoulders are very sharp. The front *tibia* ends in four short lobes and the middle and hind tibiæ have each a very small lateral spine.

♂. Black, not very glossy, the head and pronotum partly or entirely dark brown, the sides of the pronotum more or less yellow or red and the elytra bright yellow, with the extreme outer margins and a narrow sutural triangle, extending from the middle of the base of each elytron to the extremity of the suture, black. The *head* and *pronotum* are densely granular and opaque, the former with the front margin rather strongly excised, the front angles blunt, the cheeks a little rounded behind the eyes. The clypeal process is narrow, moderately long and tongue-shaped. The *elytra* are finely and closely punctured, rather shining in the anterior sutural region and coriaceous and dull at the sides and apices. The front *tibia* is rather feebly forked at the extremity, the middle tibia has a minute lateral spine and the hind tibia has none.

Variation of the male. In a small specimen the head is a little convex behind, the mandibles are about as long as the

head, evenly curved externally and serrate from the base almost to the tip. In a much larger example (the type) the head is a little depressed anteriorly, the mandibles are a little longer than the head, the apical half only is serrate and there is a broad basal process.

♂. *Length* (with mandibles), 20–33 mm.; (without mandibles) 18–26 mm.: *breadth*, 7·5–11 mm.

♀. *Length*, 19–22 mm.; *breadth*, 8–9 mm.

S. India: Ouchterlony Valley, Nilgiri Hills, 3500 ft. (*H. L. Andrewes*, June). Bombay: Gersoppa, N. Kanara (*C. McCann*, June).

Type in the British Museum.

63. **Dorcus prosopocœloides.** (Plate XI, fig. 19.)

Pelecognothus prosopocœloides Houlb.,* Insecta, v, 1915, p. 53, figs. 12 & 13.

♂. Very dark reddish-brown, with the sides of the head, the extreme edges of the pronotum, the scutellum, the inner and outer margins of the elytra, the antennæ, knees, upper edges of the tibiæ and the tarsi black; the surface without clothing of hairs or setæ, except the pale hairy pads of the tarsi. Long and narrow, with rather slender legs. The prosternum is very short behind the coxæ, slightly compressed and very blunt and rounded. The head is narrow and elongate, finely granular and opaque, the front angles very obtuse, the canthus not very prominent, slightly oblique, reaching the middle of the eye, which is very small, the head behind the eyes long, very feebly swollen at the side. The *head* is a little hollowed in front, its upper margin gently arcuate. The clypeal process is bilobed and very short. The mandibles are flat, very acute at the tips and bear a broad internal lobe which is sharply toothed in front and rather bluntly at the base. The *pronotum* also is densely granular and opaque, especially at the sides. The front angles are produced but blunt, the sides rather abruptly contracted in front and rather straight and parallel behind to the spiniform lateral angles and oblique and nearly straight from there to the rounded hind angles. The base is straight. The *scutellum* bears a few punctures. The *elytra* are coriaceous and opaque, with the sutural margins more shining. There are incomplete lines of fine shallow punctures as well as similar close irregular punctures, which are larger and closer at the sides. The shoulders are very sharp. The *prosternum* is very short and bluntly rounded behind. The *legs* are fairly slender, the front tibia with very minute sharp serrations in its anterior half and a very short and feeble terminal fork, the middle and hind tibiæ are without lateral spines.

♀. Unknown.

♂. Length (with mandibles), 18-20 mm.; (without mandibles) 17–18 mm.: *breadth*, 7 mm.

BHUTAN: Maria Basti.

Type in the Oberthur collection; co-type in the British Museum.

The peculiar features of this species are in many respects similar to those of *D. elegans* and it is probable that the known specimens, consisting only of males, are not of full development and that larger examples will be found to have the mandibles, as in *D. elegans*, very long for an insect of such small size.

64. **Dorcus elegans.** (Plate XI, fig. 20.)

Cladognathus elegans Parry,* Proc. Ent. Soc. 1863, p. 110; Trans. Ent. Soc. 1864, p. 27, pl. 8, fig. 3.
Digonophorus Atkinsoni Wat.,* Ann. Mag. Nat. Hist. (6) xvi, 1895, p. 157.
Hemisodorcus elegans Nagel, Deutsche Ent. Zeitschr. 1928, p. 277.

♂. Bright reddish-yellow, with the tips of the mandibles, the elytral suture, the knees, tarsi and antennæ black, the surface rather dull, but with the scutellum and elytral suture glossy. Very narrowly elongate, with slender legs. The *head* is long, very finely coriaceous and opaque, flat above, widest across the eyes, which are very small and not prominent, and gradually narrowed behind them. The front angles are very blunt, the front margin vertical, with a sharp arcuate ridge above. The clypeal process is very short and transverse, separated by a fine suture from the front. The antennal scape is flattened, extremely thin and very slender at the base, the three joints of the club are very short and the seventh joint is not produced. The *pronotum* is also very finely coriaceous and dull but less so in the middle than at the sides. The front angles are produced but rather blunt, the lateral margins are gently sinuate in front, leaving a blunt projection behind, in front of the spiniform lateral angle, and sinuate from the latter to the hind angle, which is well marked but blunt. The *elytra* are rather flat and produced to a point behind, coriaceous and opaque except close to the suture, where they are very smooth and shining. The prosternal process is strongly compressed and rather sharply pointed. The lower surface is very smooth. The front tibia is very slender, rather feebly bifurcate at the extremity, with a few minute sharp lateral teeth, close together near the end, and the middle and hind tibiæ are without lateral spines.

Variation of the male. In the type specimen (a very small example) the head and thorax are more transverse than in larger specimens and the mandibles are little longer than the head. They are flat, parallel-sided and straight at the base,

curved at the end, acutely cleft internally before the tip, which is very sharp, the inner lobe truncate. The pronotum has a few large punctures in the middle and finer, more numerous, ones at the sides. The elytra show rather faint, finely punctured, striæ. Both punctures and striæ disappear in larger examples, the head and prothorax are exceptionally narrow and the mandibles long and slender. In large examples, such as the type of *atkinsoni* Wat., the mandibles are perfectly straight for $\frac{3}{4}$ of their length, the truncate inner lobe has three minute cusps at the end and the sharp-pointed outer lobe bears three or four blunt teeth beneath.

♀. Unknown.

Herr Nagel has described a specimen of unknown origin which he considers to be a female of this species but, until adequate grounds exist for associating the two sexes, it will be safer to regard the female as yet unknown.

♂. *Length* (with mandibles), 27–34 mm.; (without mandibles) 19–22 mm.: *breadth*, 6·5–7·5 mm.

Darjeeling Distr.: Pashok, 5500 ft. (*F. H. Gravely*, June); Pedong (*L. Durel*); Kurseong (*Rev. Père Bretandeau*). ? Malay Peninsula.

Type in the Oberthür collection; that of *atkinsoni* in the British Museum.

In my opinion the locality Singapore attributed to this very curious species by Waterhouse is probably incorrect.

65. **Dorcus suturalis.** (Plate XI, figs. 8–10.)

Lucanus suturalis Oliv., Ent. (1) i, 1789, p. 16, pl. iv., fig. 12.
Cladognathus suturalis Parry, Trans. Ent. Soc. Lond. 1864, p. 25.
Metopodontus suturalis Planet, Bull. Soc. Ent. France, 1899, p. 225, figs. ♂ & ♀.
Dorcus suturalis Arrow, Trans. R. Ent. Soc. Lond. lxxxvi, 1937, p. 240, pl. 3, figs. 1 & 2.

Bright yellow above, with the antennæ, legs (except the femora in part) and lower surface darker and the edges of the mandibles, head, thorax and elytra, a V-shaped mark upon the head and the middle line and a small lateral spot upon the pronotum black or very dark brown. The male opaque above and the female very glossy. The three club-joints of the antenna moderately long and the seventh joint sharply produced. The prosternum compressed and prominent behind, but rounded and not pointed.

♀. Very shining above, oval and convex. The *head* is very coarsely punctured. The pronotum is very coarsely and closely punctured at the sides and sparsely and finely elsewhere. The front angles are blunt, the sides strongly rounded, without distinct lateral or basal angles. The *elytra* are rather strongly punctured and fairly closely, except upon the inner anterior part. The apices are very coarsely and densely pitted. The

front *tibia* is gently curved, the extremity palmate, the outer edge serrate, with a few very fine prominent teeth.

♂. Opaque above, with the middle line of the pronotum and the elytral suture feebly shining. Rather depressed in form, with the legs very slender. The *head* is finely and densely granular, rather long, with the sides nearly straight and parallel, the front angles very obtuse. The *pronotum* is short and broad and densely granular. The front angles are bluntly produced, the sides very feebly rounded to the lateral angles, which are almost obsolete, and placed far back near the very obtuse hind angles, with which they are united by a short straight line. The *elytra* are very finely and densely punctured, except close to the suture, where the punctures are scattered, The front tibia is very minutely serrate at the outer edge. without any distinct outstanding teeth, and the middle and hind tibiæ are without lateral spines. The clypeal process is pentagonal.

Variation of the male. The front of the head, sloping in small specimens, is vertical in well-developed ones, the upper margin sharply carinate. In small examples the mandibles are as long as the head, simple, with the inner edge serrate in the basal part only (Plate XI, fig 8). In larger specimens a gap appears between a broad basal tooth and the succeeding serrations. At maximum size they are little longer than the head and relatively rather broad (Plate XI, fig 9).

Constant phase (Plate XI, fig. 10. The mandibles assume another form in certain full-sized specimens. They are long and slender (about twice as long as the head), gently curved, with an internal tooth at about one-third of their length, another at about two-thirds and two teeth between the last and the tip.

♂. *Length* (with mandibles), 23–44 mm ; (without mandibles) 19–28 mm. : *breadth*, 8–12 mm.

♀. *Length*, 16–22 mm. ; *breadth*, 6·5–10 mm.

SIKKIM : Mangpu (*E. T. Atkinson*). ASSAM. TONKIN.

Type in the Royal Scottish Museum, Edinburgh.

I have examined 11 specimens of the inconstant and 10 of the constant phase, which are very sharply separated. There is apparently no transition from one to the other.

66. **Dorcus nageli.** (Plate XII, fig. 17.)

Dorcus nageli Arrow,* Trans. Ent. Soc. Lond. xxxviii, 1935, p. 112, pl. 6, fig. 1.

Brownish-black, with the elytra, lateral margins of the pronotum and the lower surface chocolate-brown, the lower surface of the tarsi and the inner edge of the four posterior femora and tibiæ fringed with close-set short yellow hairs. Opaque above and not very shining beneath, depressed, rather

narrow but with the prothorax broad. The sides of the latter gently and evenly rounded, without lateral angulation, the base very broad and the hind angle rounded. The scutellum evenly punctured. The sides of the elytra nearly straight and parallel and the shoulders acute. The prosternal process short and rather bluntly pointed. The entire outer edge of the front tibia is finely serrate, with larger but rather minute sharp teeth, rather widely spaced, and the middle and hind tibiæ have each a well-marked lateral spine near the middle. The club of the antenna moderately long and the seventh joint sharply produced.

♂. The upper surface is entirely opaque, the head rather closely and evenly but not strongly or densely punctured, the pronotum with the punctures fine and not very close in the middle and becoming strong and dense at the sides. The *head* is flat and moderately broad, with very blunt front angles and without trace of prominence behind the eyes. The clypeal process is short and rather broad, with the front margin straight and the angles blunt. The mandibles are very short, strongly and evenly curved, very sharply pointed, with a short truncate or two-cusped horizontal tooth above, near the middle of the inner edge, united by a curved line to the basal part and forming an acute angle with the apical part. The *pronotum* is much broader behind than in front and the front angles are produced but not very sharp. The *elytra* are finely and very densely punctured, a little less densely near the base, with a narrow smooth sub-nitid sutural strip marked off by an irregularly punctured stria. The *mentum* is very densely clothed with erect yellow hairs.

♀. Unknown.

Length (with mandibles), 17 mm.; (without mandibles) 16 mm.: *breadth*, 7 mm.

Assam

Type in the British Museum.

Closely resembling *M. humilis*, it is distinguished at first sight by its entirely opaque upper surface. The prothorax is relatively wider and the elytra are narrower than those of *M. humilis*. The tarsal fringes are shorter than in that species, the front tibiæ are rather more strongly toothed and the four posterior tibiæ have larger spines. The prosternal process is shorter and blunter.

67. **Dorcus vernicatus.** (Plate XII, fig. 16.)

Dorcus vernicatus Arrow,* Ann. Mag. Nat. Hist. (11) ii, 1938, p. 58, pl. 4, fig. 7.

♂. Black, with the femora blood-red, except at the base and tip, the tarsi conspicuously clothed with yellow hair beneath.

The body is long and narrow, the legs fairly short, the head and pronotum opaque and almost unpunctured, the elytra very smooth and shining. The *head* is short, flat, the eyes moderately large, the sides straight and parallel before the eyes and contracted behind them, the front angles blunt. The clypeal process is transversely rectangular, not very broad, the front margin almost straight. The mandibles are short, strongly curved, each with a strong, short, oblique tooth, sharp at the tip, placed near the middle. The *prothorax* is much broader than the elytra and has strongly reflexed margins, the sides straight and convergent in front and strongly rounded behind, without lateral or basal angles, the front angles produced and blunt. The *scutellum* bears a few fine punctures. The *elytra* are narrow, very smooth and shining, with very minute punctures, which become closer and more conspicuous at the sides. The basal margin is rather strongly punctured and there is a single row of punctures adjoining the suture and extending from the base to a little beyond the middle. The shoulders are sharply angular. The *prosternum* is compressed and rather sharply angular behind. The front *tibia* is finely serrate externally, with two minute but larger teeth and the terminal fork is not long. The middle and hind tibiæ are without lateral spines.

♀. Unknown.

Length (with mandibles), 19 mm.; (without mandibles) 16 mm.: *breadth*, 7 mm.

Assam: Shillong district.

Type in the René Oberthür collection.

I know only the unique type.

The close relationship of this little insect to *D. nageli* and *humilis* is evident. It is of almost the same size and shape as the former, but the elytra are still more narrow amd elongate and extremely glossy, instead of being, like the head and pronotum, dull black. The prothorax is vey short and broad, as in *D. nageli*, but, together with the head, is scarcely visibly punctured, and the sides are straight and convergent from near the base to the front angles, which are strongly produced but very blunt. The sides of the head in front of the eyes are more straight and parallel than those of *nageli* and the clypeal process is rather more prominent, with sharper angles. The mandibles are a little longer, the lobe at the inner edge is more developed, arises rather nearer the base and is produced to a sharp point. The legs and antennæ are more slender than those of the related species and the middle and hind tibiæ are without the strong spine at the outer edge. The prosternum is more elevated and produced behind.

68. **Dorcus humilis.** (Plate XII, fig. 9.)

Dorcus humilis Arrow, Trans. Ent. Soc. Lond. lxxxiii, 1935, p. 111, pl. 6, fig. 3.

Black, with the femora generally dark red, the inner edge of the four posterior tibiæ and the under surface of the tarsi clothed with close yellow hairs. Small, rather narrow and not very convex. The pronotum rather broad behind and its sides strongly and evenly rounded there, without trace of a lateral angulation or hind angle. The scutellum bears a few punctures. The sides of the elytra nearly straight and parallel and the shoulders acute. The prosternum prominent behind, a little compressed and bluntly pointed. The entire outer edge of the front tibia finely serrate, with three or four slightly larger teeth in the apical part, and the middle and hind tibiæ are fairly stout. The seventh joint of the antenna acute and the three club-joints short.

♀. The upper surface is very shining. The *head* is strongly and closely punctured, with a slight indefinite elevation on each side. The mandibles are narrow, a little compressed, less strongly curved than those of the male, with an interior tooth at the lower edge and another at the upper edge. The *pronotum* is punctured, very finely and not closely in the middle, more strongly round the margins and very closely and rugosely at the sides. The *elytra* bear each a juxta-sutural row and three double dorsal rows of punctures and the sides and apices are closely punctured. The middle and hind *tibiæ* have each a minute lateral spine.

♂. The head and pronotum are opaque, the former with scattered punctures, generally confined to the sides, the latter with very fine punctures in the middle, becoming more numerous and distinct near the margins and at the sides. The *head* is rather broad in front, but with the front angles blunt, and there is no trace of prominence behind the eyes. The clypeal process is transversely rectangular, with the angles blunt. The mandibles are very short, strongly and evenly curved, very sharply pointed, with a strong horizontal tooth above, near the middle of the inner edge, bluntly rounded at the end, united by a curved line with the basal part and forming an acute angle with the apical half. The *pronotum* is much narrower in front than behind and the front angles are produced but blunt. The *elytra* are very glossy, the basal margin is rugose, the outer half finely and closely punctured anteriorly and coriaceous behind. There is a single row of punctures adjoining the suture. The *mentum* is shining and rather evenly punctured. The middle and hind *tibiæ* have no lateral spine. All the tarsi bear large hairy pads beneath all but the last joint.

♂. *Length* (with mandibles), 15–17 mm.; (without mandibles), 13·5–15·5 mm.: *breath*, 6 mm.

♀. *Length*, 14–15 ; *breadth*, 6 mm.

Sikkim : Gopaldhara, Rungbong Valley (*H. Stevens* & *W. K. Webb*). Bhutan (*L. Durel*).

Type in the British Museum.

A male specimen acquired by M. Oberthür from the Rothschild collection is supposed to have been taken in the Khasi Hills, but the collector's name is not recorded and this locality requires confirmation.

The mandibles of the male seem to remain almost at the minimum development in this species. It is, of course, possible that larger specimens than those known to me may occur, with larger mandibles, but the almost uniform size of the seven examples I have examined gives no indication of a greater development.

69. **Dorcus buddha.** (Plate XV, figs. 8–10.)

Lucanus buddha Hope,* Trans. Linn. Soc. xix, 1845, p. 107.
Lucanus thibeticus Westw.,* Trans. Ent. Soc. Lond. 1855, p. 199, pl. 10, fig. 3.
Prosopocœlus cardoni Did.,* Bull. Soc. Ent. France, 1927, p. 220.

Black, with the elytra extremely glossy, except at the outer margins. Elongate, rather parallel-sided and not very convex, the prothorax distinctly broader than the elytra at the shoulders. The prosternum strongly elevated and sharply pointed behind. The three terminal joints of the antenna moderately long and the seventh joint produced into a slender process.

♀. The *head* is opaque and distinctly but not densely punctured. The *pronotum* is very sparsely and finely punctured and shining in the middle, more strongly punctured and entirely opaque at the sides. The lateral margins are very gently curved, the front angles sharp and the hind angles rounded. The lateral margins of the *elytra* are rather coriaceous and dull. The front *tibia* is very slender, curved outwards, with numerous minute teeth upon its outer edge, the extremity not forked but produced into a long finger-like process, flanked by a short process above and another beneath. The apical edge bears a conspicuous tuft of red hairs. The lateral spines of the four posterior tibiæ are very minute.

♂. The *head* is broad, finely and densely granular and opaque, the sides obtusely angular in front of the eyes, with a broad swelling behind. The *pronotum* is very broad, the sides are straight and almost parallel (but slightly diverging to the base in the largest specimens), the front angles produced but truncate at the tip, the lateral angles prominent but obtuse and almost level with the base, the hind angles only very feebly indicated. The surface of the pronotum is finely and densely granular except in the middle. The *elytra* are very smooth and shining,

with the lateral margins very finely granular. The front *tibia* is finely and sharply serrate externally and the middle tibia bears a minute lateral spine.

Variation of the male. In small specimens the sides of the pronotum are slightly curved and the angulation is very blunt. In larger males the sides are almost straight, the front angles more produced and the posterior angulation very strong. The mandibles of small examples have the inner edge straight and serrate almost from base to tip. In larger ones the terminal part only is serrate, the first tooth stronger than those that follow. In highly developed specimens this tooth (situated about one-third from the tip) is sharp, immediately followed by a few serrations, the terminal part of the mandible is smooth and the extreme tip is forked. There is another small tooth near the base internally. The mandibles of large specimens are long and rather straight to the point of origin of the large tooth and strongly curved from there to the tip. The head has a sharp curvilinear anterior ridge, absent in small specimens, and is a little hollowed in front of this.

♂. *Length* (with mandibles), 25–52 mm.; (without mandibles) 21–35 mm.: *breadth*, 9–15 mm.

♀. *Length*, 19–23 mm.; *breadth*, 8·5–10 mm.

United Prov.: Dehra Dun (*C. F. C. Beeson*, June, July, August); Manduwala (*R. L. Sharma*, August). Sikkim: Mangpu (*E. T. Atkinson*). Bengal: Chota Nagpur, Nowatoli (*R. P. Cardon*, Aug., Sept.).

Types of *buddha* and *thibeticus* in the Hope Dept., Oxford Museum, that of *cardoni* in Dr. Didier's collection; co-type in the British Museum.

This was taken by Dr. Beeson on *Grevillea robusta*.

70. **Dorcus groulti.** (Plate XII, fig. 7.)

Falcicornis groulti Planet, Le Naturaliste, xvi, 1894, p. 44, fig.
Dorcus barbarus Jordan, Nov. Zool. i, 1894, p. 485, pl. 13, fig. 2; tom. cit. p. 692.

Rust-red, with the head and lower surface a little darker, the tarsi thickly clothed with yellow hair, the body small, rather narrow and depressed. The prosternum compressed.

♂. Rather smooth and shining, with the head and pronotum opaque, except the middle of the latter. The *head* is broad and flat, the eyes large and rather prominent, the sides of the head oblique before the eyes and contracted behind them. The clypeal process is prominent, transversely rectangular, straight in front, with the angles rather sharp. The *pronotum* is very short and broad, with a few fine punctures in the middle and near the margins. The front angles are rounded and strongly produced, the sides nearly straight and parallel, without lateral angle, the hind angle blunt and the base very broad. The

elytra are long and narrow, broadest at the base, where they are much narrower than the base of the pronotum, and tapering to the extremity. They are finely and closely punctured, the punctures becoming gradually stronger and closer towards the outer margins ; each has a juxta-sutural line and three paired lines of punctures, the latter not reaching the extremity. The shoulders are acute. The *legs* are not very slender. The front tibia is rather feebly forked at the tip and the outer edge is very minutely serrate, with two or three very small teeth ; the middle and hind tibiæ are closely fringed at the inner edge and without lateral spines. The tarsi have long hairy fringes.

Variation of the male. A small specimen in M. Oberthür's collection has the head and prothorax only moderately broad, the sides of the former and most of the surface of the latter, finely but distinctly punctured and the sides of the prothorax very slightly converging towards the front. The mandible is short, straight to just beyond the middle and uniformly curved from there to the tip. The basal half has an abrupt, rather rectangular, dilatation internally. In well-developed specimens head and thorax are very broad, the latter not at all narrowed in front and strongly lobed at the front angles. The punctures are very fine and inconspicuous. The mandible is abruptly bent in the middle, the basal and apical halves almost straight and at right angles to each other, the basal half with a triangular dilatation internally, produced to a sharp point

♀. Unknown to me. Both sexes are figured by Planet.

♂. *Length* (with mandibles), 16–23 mm. ; (without mandibles) 14–18·5 mm. : *breadth*, 6–9 mm.

ASSAM : Khasi Hills, Shillong.

Types. That of *barbarus* Jord. in M. Oberthür's collection ; location of that of *groulti* uncertain.

Although the well-developed males of *Dorcus groulti* which have been figured both by Planet and Jordan present a marked difference from the males of *D. humilis*, the two species are certainly closely related. *D. groulti*, however, is lighter in colour and the male, like the female, has clearly punctured elytra, with three distinct double rows of punctures. I have not seen the female of that species but it is described as having the pronotum very closely punctured and marked with a round pale spot on each side. The generic characters of *Falcicornis* are confined to the well-developed males and in my opinion the genus cannot be maintained.

71. **Dorcus biplagiatus.** (Plate XI, figs. 1–3.)

Lucanus biplagiatus Westw.,* Trans. Ent. Soc. Lond. 1855, p. 200, pl. 10, fig. 4.

Metopodontus biplagiatus Gravely, Rec. Ind. Mus. xi, 1915, p. 420, fig. 3 c.

Metopodontus biplagiatus var. *nigripes* Boil., Le Naturaliste, xxvii, 1905, p. 17.
Prosopocœlus biplagiatus var. *andamanus* Kriesche, Stett. Ent. Zeit. 1922, p. 120.
Dorcus biplagiatus Arrow, Trans. R. Ent. Soc. Lond. lxxxvi, 1937, p. 242, pl. 1, fig. 1.

Rust-red or orange, with the head wholly or partly black; the pronotum with the extreme margins, a broad median stripe and a patch occupying the posterior angle, sometimes extending to the anterior angle, and the elytra with the outer margins rather narrowly and the sutural margins rather broadly black. The legs and lower surface sometimes red and sometimes wholly or partly black. Rather convex and compact in form and moderately shining, except the head and the sides of pronotum and elytra. The prosternum is only slightly elevated behind and not compressed or produced.

♀. Elongate-oval. The *head* is densely rugosely punctured, with the sides slightly prominent behind the eyes but less wide there than in front. The *pronotum* is punctured rather sparingly and finely in the middle and strongly and closely at the sides. The lateral margin is gently rounded, the front angle bluntly produced and the hind angle almost obsolete. The *elytra* are smooth and shining near the suture, strongly and closely punctured at the sides and apices, finely and not very closely in the intervening region. The front *tibia* is feebly toothed externally and its apex is broad and blunt.

♂. The upper surface is minutely and densely granular or punctured and not very shining, except in the region of the elytral suture. The *head* is convex and densely granular, with the anterior part a little hollowed or vertical, the upper margin semicircularly excised, the clypeal process tongue-like and truncate. The anterior angles of the head are very obtuse, the canthus reaches the middle of the eye and the sides are bluntly prominent behind the eyes. The *pronotum* is minutely and sparsely punctured in the middle and densely granular at the sides. The lateral margins are curved in front, almost straight behind, the front angles bluntly produced, the hind angles obtuse. The *elytra* are closely and minutely punctured, rather more strongly at the sides and very lightly near the suture. The front *tibia* has very minute irregular lateral teeth and the terminal fork is long and narrow. The middle and hind tibiæ are without distinct lateral spines, but the former has a deep excision of the inner edge just before the extremity and the latter has a tooth at the same point.

Variation of the male. There is little variation in the normal phase except in size. The mandibles are very short and of simple form. They are about as long as the head, feebly curved, sharply pointed and dilated at the base internally. In the Andaman Islands two representatives of a different phase

have been found. In this phase the mandibles are long, separated at the base and not distinctly dilated, rather straight, forked at the tip and provided with a tooth beyond the base and another, a little bifurcated, before the tip. One of these specimens is in the British Museum and the other in the Indian Museum, Calcutta.

♂. *Length* (with mandibles), 24–38 mm.; (without mandibles) 21–31 mm.: *breadth*, 10–14 mm.

♀. *Length*, 20–25 mm.; *breadth*, 9–11 mm.

N.W. PROVINCE. ASSAM: Tura, Garo Hills, 1200–1500 ft. (*S. W. Kemp*, June, July); Naga Hills (*W. Doherty*); Manipur (*W. Doherty*); Dilkoosha (*Inglis*); Sadiya (*T. Bainbrigge Fletcher*, May). BURMA: Washaung, Myitkyina (*R. Malaise*, July); Momeit (*W. Doherty*). TENASSERIM. ANDAMAN IS. SIAM. TONKIN. CAMBODIA.

Type in the British Museum.

In males from the Andaman Islands (var. *andamanus*), but not in the females, the black sutural stripe does not dilate in front as in specimens from other regions and the lateral stripe is rather narrow.

72. **Dorcus inquinatus.** (Plate XI, figs. 6, 7.)

Lucanus inquinatus Westw.,* Cabinet of Orient. Ent. 1848, p. 18, pl. 8, fig. 4.

Metopodontus biplagiatus var. *indicus* Gravely, Rec. Ind. Mus. xi, 1915, p. 420 (new syn.).

Black and shining above and beneath, with a broad bright orange stripe upon each elytron near and parallel to the outer edge, beginning close to the base and almost reaching the suture. Body rather broad, compact and convex. The prothorax and elytra short, the lateral margins of the former gently rounded, the front angle very blunt, the hind angle distinct but inconspicuous, and the base rounded at the sides and straight in the middle. The prosternum rather flat behind the coxæ, not at all pointed or elevated. The antennal club is composed of three moderately long joints and the seventh joint slightly produced.

♀. The *head* is coarsely and confluently punctured, with a very slight lateral angulation immediately behind the eye, and the mandibles are rather narrow, with a small internal tooth. The *pronotum* is a little longer than that of the male and rather more strongly punctured. The *elytra* also are rather more distinctly punctured than those of the male, but not less shining. The sides are very strongly and closely punctured. The *metasternum* is entirely shining, with a few fine punctures at the sides, and the abdomen is smooth and shining, except the last sternite, which is strongly punctured. The front *tibia* has a broad, four-pointed extremity and the middle and hind

tibiæ have each a small lateral spine placed far past the middle.

♂. The *head* is rather convex, with the ocular canthus extending past the middle of the eye, very bluntly angular in front. Behind the eye there is a blunt, obliquely placed, process on each side. The upper surface of the head is closely punctured, except in the median posterior part, where the punctures are fine and scattered. Elsewhere there are fine and coarse punctures together, those at the sides very coarse. The *pronotum* bears fine scattered punctures, except at the sides and the lateral part of the front margin, which are rugosely punctured. The *elytra* are very smooth, very minutely punctured, except at the sides, which are densely and rather more strongly punctured. The *metasternum* and *abdomen* are smooth and shining but the former is opaque at the sides and has a finely punctured depression in the middle. The front *tibia* is minutely toothed externally and has a terminal dilatation externally, carrying a short hooked spur. The middle and hind tibiæ are without distinct lateral spines, the former has also an abrupt internal dilatation at the end, with a short hooked spur, and the hind tibia has a blunt internal tooth a little before the end and is without the usual spurs.

Variation of the male. In a small male the mandibles are much shorter than the head, strongly curved, with a blunt basal tooth and another near the tip. A rather larger example (the type) has them a little longer than the head and more slender, with the second tooth farther from the base and tip but not larger. It is probable that a greater development occurs.

♂. *Length* (with mandibles), 29–33 mm. ; (without mandibles) 25–27 mm. : *breadth*, 11–12 mm.

♀. *Length*, 26 mm. ; *breadth*, 12 mm.

Southern India : Somwarpett, Coorg (*L. Newcome*, July).

Type in the British Museum.

73. **Dorcus candezei.** (Plate XII, fig. 15.)

Metopodontus candezei Boil., Le Naturaliste, xxiv, 1902, p. 203.

Black, closely sculptured above and not shining, except upon the pronotum of the male. Very short, compact and convex, with rather short legs and antennæ. The sides of the head oblique in front of the eyes and slightly and bluntly prominent behind them. The pronotum strongly punctured and without lateral angulation. The elytra densely punctured and the shoulders acute. The lower surface closely punctured, except the middle of the metasternum. The prosternum sloping behind and not compressed but with a minute sharp prominence.

♀. Oval in shape, with the whole upper surface densely and rugosely punctured, not shining. The *head* is very coarsely

punctured and the postocular process is feeble. The *pronotum* is very strongly punctured but less densely in the middle than at the sides. The lateral margins are feebly rounded, the front angles very blunt and the hind angles broadly rounded. The *scutellum* is strongly punctured. The lateral and posterior parts of the *elytra* are finely and densely rugose, the inner part rather less so. The lower surface is shining but the *metasternum* is strongly punctured, except in the middle, and the *abdomen* finely and closely punctured. The front *tibia* is slender, curved outwards, minutely toothed externally and palmate at the end. The hind tibia is also a little curved. The lateral spine of the middle tibia is minute and that of the hind tibia is often wanting.

♂. The *head* is opaque and bears rather fine scattered punctures. The postocular process is short and rounded. The *pronotum* is strongly punctured, shining in the middle, where the punctures are not very close and opaque at the sides, where they are very close and rugose. The front angles are bluntly produced, the sides straight and parallel or very feebly excised near the middle, the hind angles rounded and the base broad and almost straight. The *scutellum* is punctured on each side and smooth and shining in the middle. The *elytra* are finely and very closely punctured and dull but with the sutural margins slightly shining. The front *tibia* is slender, the front and middle tibiæ have each a short hooked terminal spur, the middle tibia has a minute lateral spine and all the tibiæ have a brush of yellow hairs at the end of the inner edge, that of the hind leg rather large.

Variation of the male. Small males have the head rather strongly punctured, the mandibles simple, gently curved, not serrate, with a slight basal prominence. Larger examples have the head finely and scantily punctured, the mandibles only a little longer, with a feeble internal tooth near the middle. The largest males have the tooth nearer the tip, the head is more opaque, with rather indistinct punctures and the postocular process is stronger.

♂. *Length* (with mandibles), 20–28 mm.; (without mandibles) 17–23 mm.: *breadth*, 8–10 mm.

♀. *Length*, 19–20 mm.; *breadth*, 9 mm.

S. India: Agsur, N. Kanara (*T. R. D. Bell*, Feb.); Nilgiri Hills (*H. L. Andrewes*); Tinnevelly, Madras (*A. Hamid Khan*, March).

Type in the Brussels Museum.

74. **Dorcus occipitalis.** (Plate XI, figs. 11–13.)

Lucanus occipitalis Hope & Westw.,* Cat. Luc. Col. 1845, p. 13.
Metopodontus occipitalis Boil., Trans. Ent. Soc. Lond. 1913, p. 226.

Cladognathus marginatus Burm.,* Handb. Ent. v, 1847, p. 369; Arrow, Trans. R. Ent. Soc. Lond. lxxxiii, 1935, p. 107.
Var. *Metopodontus ræpstorffi* Wat.,* Ann. Mag. Nat. Hist. (6) v, 1890, p. 35.

Bright yellow, opaque above in the male, mainly shining in the female, the mandibles and tibiæ more or less reddish, the antennæ, tarsi, three spots placed transversely upon the pronotum and the extreme edges of the prothorax and elytra black, the thoracic spots placed one in the middle and one near the lateral margin on each side. Compact and moderately broad. The lamellæ of the antennal club short and the seventh joint produced into a spine-like process. The prosternum produced and pointed behind.

♀. The upper surface is shining, strongly punctured and more convex than that of the male, the mandibles, the sides of the head and the scutellum are black or very dark red and there is a well-marked black sutural stripe upon the elytra. The *head* is coarsely and in front rugosely punctured. The *pronotum* is strongly and closely punctured, with a narrow smooth median stripe, and the lateral margins are rugose. The *elytra* are densely punctured. The lower surface is strongly punctured, except the middle of the metasternum, where the punctures are fine. The front *tibia* is broad at the end, where it has four short lobes.

♂. The upper surface is opaque, but the middle of the head and pronotum less so than the sides, and the scutellum and elytral suture are rather shining. The front angles of the *head* are rounded or very obtuse, the eyes are small and not at all prominent and there is a pointed lateral process behind each eye. The *pronotum* is short and broad, the front angle is produced but blunt, the sides are rounded to far behind the middle, where there is a distinct but not acute angle, and straight to the base, the hind angle very obtuse. The *elytra* are finely and closely punctured but more sparsely in the anterior part. The shoulders are acute-angled and the apices a little produced and flattened. The lower surface is opaque, except in the middle of the sterna. The front *tibia* is very finely serrate at the outer edge, with four or five very small sharp teeth, and dilated internally at the end, where it bears a strongly hooked terminal spur. The middle and hind tibiæ are without lateral spines.

Variation of the male. In small specimens the head is flat above and the mandibles are broad and flat, with their inner edges contiguous and irregularly serrate. In larger specimens an oblique dark-pigmented carina appears on each side, the two carinæ converging behind. The mandibles are longer, less flat and more widely separated and have two strong alternating teeth near the base and a bifid tip. At a more

advanced stage the head is very large, the two lateral carinae form a black semicircle, interrupted in the middle, and the mandibles are slender, though scarcely longer than the head, strongly curved, with a broad bilobed basal lamina, and trifid at the end. In very well-developed males the mandibles are about twice as long as the head, bifid at the tip, with an oblique tooth at a short distance from the end and another a short distance from the base. In the largest specimens the preapical tooth is bifid.

♂. *Length* (with mandibles), 22·5–37 mm. ; (without mandibles) 19–30 mm. : *breadth*, 7·5–12·5 mm.

♀. *Length*, 17–21 mm. ; *breadth*, 7·5–8·5 mm.

TENASSERIM. ANDAMAN IS. MALAY PENINSULA. BORNEO. PHILIPPINE ISLES.

Type in the Hope Dept., Oxford University Museum ; those of *marginatus* and *rœpstorffi* in the British Museum.

In the Andaman Is. the dark sutural stripe of the female dilates, whether invariably or not it is not yet possible to say, into an oval patch of variable size. The name *rœpstorffi* was given to this form. The type is a male of low development in which the female coloration appears. A well-developed male from the same islands has the typical male coloration found in continental localities.

75. **Dorcus henryi.** (Plate XII, fig. 5.)

Dorcus henryi Arrow,* Trans. Ent. Soc. Lond. lxxxiii, 1935, p. 110, pl. 6, fig. 5.

Entirely black, with the head and pronotum shining, except at the sides, and the elytra rugosely punctured and dull, except near the suture ; subcylindrical in shape, with the legs short ; the prosternal process vertical in front, not distinctly compressed or pointed.

♂. The *head* is lightly coriaceous, fairly strongly but not closely punctured, a little depressed in front, with the front angles rounded and a strong pointed process on each side behind the eye. The clypeal process is tongue-like, a little broader than long. The mandibles are short, stout and laterally compressed, each with a strong pointed tooth beneath, directed forward and inward, the extremities of the mandibles obliquely truncate, co-adapted and closely serrate. The *pronotum* is shining, minutely and sparsely punctured, except at the sides, which are strongly and closely punctured and opaque, with a marginal depression near the middle on each side. The front angles are blunt, the lateral margins rounded and not distinctly angulate, and the hind angles completely obsolete. The *scutellum* is well punctured. The *elytra* are closely punctured, rather finely near the suture, but the puncturation becoming

dense and rugose towards the sides and apices. The *legs* are short, the front tibiæ fairly slender, the extremities a little produced and minutely tridentate, the outer edge with very minute scattered teeth, the middle and hind tibiæ each with a small spine near the middle, all the tarsi very short and filiform.

Length (with mandibles), 26 mm.; (without mandibles) 23 mm. : *breadth*, 10 mm.

Ceylon : Pulmoddai, Trincomali district (*G. M. Henry*, Aug.).

Type in the British Museum.

I have seen only a single male specimen, taken by Mr. Henry at light in a jungle village near the sea, about 30 miles north of Trincomali, in the dry season and presented by the captor to the British Museum.

Although differing in certain well-marked details, this species is very closely related to *M. oweni* Hope and *M. pascoei* Boil., and closely resembles them in form and size. The most important difference is in the much shorter tarsi, those of the male type specimen being distinctly shorter than those of the female of *M. oweni*, in which they are much shorter than in the male.

Another important difference is found in the strong punctur-ation of the upper surface. In contrast to the other two species the head and thorax are shining, except at the sides, and the elytra are dull, in consequence of their subrugose puncturation. The head and mandibles have the same form as those of the two allied species, the mandibles having each a single strong process beneath, as in *M. pascoei*. The prothorax has no lateral angle.

76. **Dorcus pascoei.**

Prosopocœlus pascoei Boil.,* Bull. Soc. Ent. France, 1913, p. 330, figs. 1 & 2.

Black or very dark reddish-brown, not very shining, the femora of the male bright red or orange, the tarsi clothed beneath with yellow setæ, the body otherwise without hairy clothing. Moderately compact and convex, with fairly slender legs. The canthus extending past the middle of the eye and the sides of the head triangularly produced on each side behind the eye. The pronotum short, the front angles broadly rounded, the sides very gently curved to the sharp lateral angle and straight from there to the base, the hind angle rounded. The sides of the elytra rounded, the shoulders not very acute. The prosternum compressed and slightly pointed behind.

♀. Oval and convex. The *head* is strongly punctured except in the middle of the posterior part and the sides are obliquely

curved in front and bluntly produced behind the eyes. The *pronotum* and *elytra* are entirely punctured, the former rather sparingly in the middle and more strongly and very densely at the sides, the elytra rather closely and at the sides and apices densely. The sides of the *metasternum* are closely and the abdomen sparsely punctured. The front *tibia* is rather narrow and ends in a palmate process and the middle and hind tibiæ have each a strong lateral spine.

♂. The head and pronotum are densely and finely granular and opaque, the latter less densely in the middle. The *head* is flat above, strongly excised in front, the front angles are obtuse and the sides bear a very strong acutely angular process behind each eye. The clypeal process is tongue-like, narrow and bluntly pointed. The *pronotum* is short, the front angles form broadly rounded lobes, the lateral angles are spiniform and from there the sides are straight to the broadly rounded hind angles. The *elytra* are very minutely and closely punctured, slightly shining upon the inner half and dull upon the outer half and the extremities. The *metasternum* and *abdomen* are opaque, except in the middle. The front *tibia* is slender, with minute lateral teeth and the middle and hind tibiæ are without a lateral spine or with only a very minute one.

Variation of the male. This no doubt is as in *D. oweni.* I have seen only two males. In the smaller one the head is less broad than in the other, the mandibles are short and broad, finely and closely toothed at the inner edge, except in the basal part, and there is a single short but sharp tooth beneath at a short distance from the base. In the larger (type) specimen the head is very broad, the mandibles are more wide apart at the base, but still apposable in the anterior half, which is finely toothed, and the single lower tooth is very strong, sharp and has an obliquely downward direction. The lateral edges of the prothorax are slightly concave in the middle.

♂. *Length* (with mandibles), 24–29 mm.; (without mandibles) 20–23 mm.: *breadth*, 9–10 mm.

♀. *Length*, 19 mm.; *breadth*, 9 mm.

TENASSERIM. MALAY PENINSULA: Penang. N. BORNEO: Brunei.

Type in the British Museum: co-type in Dr. Didier's coll.

77. **Dorcus oweni.** (Plate X, figs. 1, 2.)

Lucanus oweni Hope & Westw.,* Cat. Luc. Col. 1845, p. 14.
♀. *Lucanus subangulatus* Hope & Westw.,* *op. cit.* p. 24.
Cladognathus oweni Parry, Trans. Ent. Soc. Lond. (3) ii, 1864, p. 82.
Prosopocœlus oweni Boil., *op. cit.* 1913, p. 229.

Black or brownish-black and rather dull above and beneath but usually with the sutural region of the elytra more or less

shining. Convex and not very elongate, with moderately slender legs. The canthus extending past the middle of the eye and the sides of the head triangularly produced behind the eyes. The pronotum short, with the front angles blunt, the sides gently curved to the lateral angles, which are sharp but inconspicuous, and almost straight to the hind angles, which are very broadly rounded. The shoulders of the elytra sharp. The prosternum vertical behind and a little compressed.

♀. The *head* is strongly punctured, except upon the posterior median part and the sides are obliquely curved in front of the eyes and produced behind them into small blunt triangular processes. The *pronotum* is finely and sparingly punctured in the middle and very strongly and closely at the sides. The *elytra* are closely and distinctly punctured in the middle and strongly and densely at the sides and apices. The sides of the *metasternum* and *abdomen* bear scattered punctures and the first and last sternites of the latter are strongly punctured. The *front* tibia is trilobed at the end.

♂. The *head* and *pronotum* are densely minutely granular and opaque, the latter rather less densely in the middle than at the sides. The head is flat above, more or less semicircularly excised in front, the canthus rather broadly rounded in front of the eye and the cheeks produced behind into strong sharp triangular processes. The clypeal process is narrow and bluntly pointed. The *elytra* are very finely and closely punctured, but slightly shining upon the inner half, very densely and confluently upon the outer half, base and apex, where they are entirely opaque. The lower surface is granular and opaque. The front *tibia* is minutely serrate and finely toothed, the terminal fork is not very divergent and the apical spur is hooked. The middle and hind tibiæ bear sharp lateral spines.

Variation of the male. In small males the mandibles are short and broad, with the inner edges in contact and serrate from base to tip but the basal part on a lower level than the rest. In larger specimens the basal part is lengthened and a single strong basal tooth on the lower level is separated by a gap from the serrate edge on the upper level. At a more advanced stage two separate teeth appear on the lower level, the serrate upper edge becoming shorter. In the largest specimens the head is very short and broad, the mandibles are only a little longer than the head and the serrate upper edges remain capable of close contact.

♂. *Length* (with mandibles), 21–35 mm.; (without mandibles) 18–26 mm.: *breadth*, 8–11 mm.

♀. *Length*, 18–24 mm.; *breadth*, 7·5–9·5 mm.

BHUTAN. DARJEELING DISTR.: Pedong (*A. De godins*) Bagdogra Range, Kurseong (*N. C. Chatterjee*, June); ♂Mangp

(*E. T. Atkinson*). ASSAM: Cherrapunji, Khasi Hills; Garo Hills, above Tura, 1200–1500 ft. (*S. W. Kemp*, June, July); Sibsagar (*S. E. Peal*). TONKIN (*H. Perrot*).

Types of *oweni* and *subangulatus* in the Hope Dept., Oxford University Museum.

Mr. Chatterjee found specimens in rotten Kaula wood.

78. **Dorcus wimberleyi.** (Plate XI, figs. 14, 15.)

Prosopocœlus wimberleyi Parry, Trans. Ent. Soc. Lond. 1875, p. 161; Arrow, Trans. R. Ent. Soc. Lond. lxxxiii, 1935, p. 106.
♀. *Hemisodorcus dvalin* Kriesche, Arch. fur Naturg. lxxxvi, A, 8, 1920 (1921), p. 98.

Rusty-red in the male, with the scutellum and the extreme edges of head, prothorax and elytra black; black in the female, with a bright orange longitudinal band on each side of prothorax and elytra, separated by about its own width from the outer edge. Rather short in form and a little depressed. The shoulders of the elytra not sharply angular. The front tibia with only extremely minute lateral teeth and the middle and hind tibiæ without lateral spines. The prosternum scarcely compressed behind, pointed but not distinctly produced.

♀. The upper surface is very smooth and glossy, except upon the head and the sides of the pronotum, which are coarsely and confluently punctured, and the sides of the elytra, which are strongly and densely punctured. Black, with orange band on each side, which arises a little beyond the front margin of the pronotum and almost reaches the posterior margin, the elytral portion beginning just beyond the front margin and continuing parallel with the outer margin to within a short distance of the suture. The greater part of the metasternum and femora are red. The lateral margins of the *pronotum* are strongly and continuously rounded from the front angles, which are fairly sharp, to the base, without lateral or basal angles.

The lower surface is very shining, the *metasternum* bearing only sparse scattered punctures, minute in the middle and larger at the sides. The last ventral sternite is very strongly punctured. The front *tibia* is very slender, strongly curved outwards and very minutely toothed at the outer edge, and bears at the end a long terminal lobe, with a shorter one beneath, another above and one or two teeth at the side. The tarsi are very short.

♂. Rusty-red, with the edges of the head, prothorax and elytra, the antennæ, tibiæ and tarsi dark; the tarsi, the elytral epipleuræ and the extremity of the abdomen clothed with bright yellow setæ. Opaque above, except upon the sutural margins of the elytra. The *head* bears a more or less sharp longitudinal ridge on each side near the eye, the front margin is laterally prominent, but not acutely, on each side, and the

cheeks are strongly and rather sharply produced behind the eyes. The *pronotum* is short and broad, finely and densely granular, with the front angles very bluntly produced, the sides straight and parallel in the middle, rounded in front and behind, without lateral or basal angle. The *elytra* are very densely punctured, except at the sutural margins, which are smooth and shining. The head is granular and opaque beneath, the *metasternum* and *abdomen* are smooth and shining, the last sternite strongly punctured. The *legs* are fairly slender, the front tibia with narrow terminal fork and almost without lateral teeth.

Variation of the male. Small specimens have the head rather strongly punctured and without lateral carinæ, the mandibles entirely serrate at the inner edge. Those more advanced are without the punctures but show an incipient oblique ridge on each side of the head. The basal part of the mandible is laterally compressed, the serrate inner edge is at the upper level and there is a single basal tooth at a lower level. In large specimens the lateral ridges of the head almost unite behind into a continuous curved carina, the serrate edge of the mandible is farther removed from the base and the lower tooth is rather long and truncate. In the largest specimen I have seen, the lower tooth is placed near the middle of the mandible and the serrate upper edge is short and occupies only the last third of the total length.

♂. *Length* (with mandibles), 16–30 mm.; (without mandibles) 14–22 mm.: *breadth*, 6–9·5 mm.

♀. *Length*, 18 mm.; *breadth*, 8 mm.

ANDAMAN IS.: (*Roepstorff*, *Capt. Wimberley*, *E. T. Atkinson*). NICOBAR IS.: (*Roepstorff*).

Type in the René Oberthür collection.

79. **Dorcus giraffa.** (Plate XIV, figs. 1, 2, 4, 5.)

Lucanus giraffa Oliv., Entom. i, 1, 1789, p. 21, pl. 5, fig. 16; F. Ent. Syst. iv, 1794, p. 452.
Lucanus confucius Hope,* Proc. Ent. Soc. Lond. 1842, p. 60; Hope & Westw., Cat. Luc. Col. 1845, p. 18.
Cladognathus bouvieri Did., Livre Jubilaire Bouvier, 1836, p. 191
(Male phase). *Cladognathus arrowi* Gravely, Records Ind. Mus. xi, 1915, p. 416.

Entirely black, smooth and shining, except upon the head, and the pronotum in the male; elongate and convex, with slender legs. The three joints of the antennal club moderately long and the seventh joint produced into a slender process. The eyes prominent and little divided by the canthus. The front angles of the pronotum truncate. The prosternum compressed and sharply angular behind, the mestasternum densely granular and opaque at the sides and the abdomen very

smooth and shining, with a few scattered punctures at the sides and close punctures and setæ at the extremity.

♀. The *head* is very coarsely and rugosely punctured, without front angles, but with a very feeble prominence behind each eye. The *pronotum* and elytra are very shining, the former very finely punctured dorsally, strongly at the sides and rugosely in the front angles. The front angles are bluntly truncate, the sides nearly straight to the feeble but distinct lateral angle and broadly rounded from there to the base. The *scutellum* is distinctly punctured. The *elytra* are very minutely punctured, except at the sides and apices, where they are finely coriaceous. The front *tibia* is sharply toothed externally and the extremity bears three or four short processes. The middle and hind tibiæ have each a strong lateral spine.

♂. The *head* is evenly and densely granular and opaque above, with the front angles sharp but not produced, and the sides of the head behind the eyes slightly but not sharply prominent. The mandibles are long and slender and not far apart. The clypeal process is almost vertical, or little hollowed, bluntly pointed in front and bears a pair of rounded tubercles between the mandibles. The *pronotum* is short, very convex and densely granular, the sides entirely opaque and the middle rather less so. It is very broad in front, where the angles are sharply truncate, forming an acutely produced outer angle. The lateral margin is bisinuate, the lateral angle acutely produced and the basal angle generally sharp but sometimes blunt and occasionally indistinct. The *elytra* are very finely coriaceous and shining, except at the sides and apices, which are more or less opaque. The shoulders are sharply angular. The front *tibia* is serrate externally, with sharp teeth at irregular intervals and a rather long terminal fork ; the middle tibia has a strong lateral spine and the hind tibia a very minute one or none.

Variation of the male. In the smallest example that I have examined, the pronotum and elytra are very shining, except at the sides, and distinctly punctured. The lateral margins of the thorax are straight and parallel, and the truncate front angles are without the usual sharp external spine. The postocular process of the head is small but prominent and the mandibles are a little longer than the head and almost straight, with a minute internal tooth near the base and another a little before the tip. In larger specimens the punctures upon the pronotum and elytra are absent, and the surface of the former is entirely granular. The basal tooth of the mandible is strong and two or three minute teeth appear in the terminal part The curvature of the mandible is very slight.

With increased size the mandibles are found to assume two different phases in different parts of the area in which the

species occurs. In the typical *giraffa* phase, which is found in Southern China, Assam, the Malay Peninsula and Java, one of the teeth towards the end of the mandible becomes larger than the rest and the terminal part acquires a strong curvature (*bouvieri* stage). In well-developed males this tooth forms a very long transverse process and the mandible is rather strongly bent inward at the point at which the tooth is situated, the two teeth on opposite sides overlapping in the closed position of the mandibles.

In the phase called *arrowi* by Gravely, which occurs in the United Provinces, the Darjeeling district and Sikkim, and also in Central China and Tonkin, the mandibles are very slender and very gently and evenly curved; the teeth are numerous, but very minute, the first one, which is placed almost halfway along the mandible, rather more strongly developed than the rest.

♂. *Length* (with mandibles), 37–95 mm.; (without mandibles) 30–60 mm.: *breadth*, 13–26 mm,

♀. *Length*, 39–42 mm.; *breadth*, 15–18 mm.

Giraffa phase.

ASSAM: Khasi Hills, Shillong, Cherrapunji. TENASSERIM. ANDAMAN IS. MALAY PENINSULA. JAVA.

Arrowi phase.

UNITED PROVINCES: Lansdowne Garhwal (*A. G. Lyell*, Oct.). BENGAL: Darjeeling; Pedong (*L. Durel*); Peshoke Spur (*R. S. Lister*); Singla, 1500 ft. (*Seebs*, July). C. CHINA: Hunan (*Miss K. V. Ryley*). TONKIN: Hoabinh (*A. de Cooman*).

Type unknown; that of *confucius* Hope in the British Museum, that of *arrowi* Gravely, in the Indian Museum, Calcutta and that of *bouvieri* in Dr. Didier's collection.

Although the difference between large specimens of the two phases is striking, females and small males are not distinguishable. Dr. Gravely described *arrowi* as a distinct species and stated that its female had the head very finely punctured, the front angles of the pronotum scarcely truncated and the end of the front tibia slender and bispinose. I have examined the specimen in the Calcutta Museum which he appears to have had before him at the time of writing and have found that it is a female of *Dorcus westwoodi* Parry.

80. **Dorcus politus.** (Plate IX, fig. 7.)

Cladognathus politus Parry,* Proc. Ent. Soc. Lond., 1862, p. 110; Trans. Ent. Soc. Lond. 1864, p. 21, pl. 10, fig. 5.

Deep reddish-brown, with the scutellum, the margins of the head, pronotum and elytra, the antennæ, knees, tarsi and parts of the lower surface black. Compact, broad and convex, and very smooth and shining above. The eyes small. The legs not

long, each of the four posterior tibiæ armed with a lateral spine. The prosternum rounded behind the front coxæ, not pointed nor distinctly compressed.

♀. The *head* is uneven, coarsely rugose in front and strongly punctured behind, except in the middle. The canthus is bluntly prominent at the middle of each eye. The mandibles are hollowed above and strongly and closely punctured and each has a blunt tooth near the middle beneath. The *pronotum* is very smooth and shining, with minute scattered punctures, except at the sides, which are coarsely and rugosely punctured. The front angles are very blunt, the sides feebly curved to beyond the middle, where there is a rather sharp angle, and the hind angles are completely rounded. The *elytra* are finely and fairly closely punctured but very shining dorsally and densely punctured and subopaque at the sides. The front *tibia* is long and slender, with the outer edge finely serrate and with a few small sharp teeth, the terminal part produced and slightly curved, widely forked, with fine teeth upon the outer branch of the fork.

♂. The *head* is finely coriaceous and opaque, with strong, rather scattered, punctures at the sides. The sloping anterior part is deeply hollowed in the middle, the anterior angles laterally produced in front of the eyes, but not very acute. The canthus extends to about the middle of the eye and the sides of the head are nearly straight and parallel behind. The clypeal process is 3-lobed, the median lobe a little produced. The *pronotum* is short and broad, very smooth and shining in the middle, dull and coriaceous at the sides and rugosely punctured near the lateral margins. The front angles are bluntly produced, the lateral margins feebly curved to beyond the middle, where there is a minute sharp angle. The hind angle is very broadly rounded. The *elytra* are very smooth and shining dorsally, with punctures which are minute and scanty near the suture but become gradually stronger and closer towards the sides, the outer margins being rugose and opaque, at least in the posterior part. The front *tibia* bears minute scattered lateral teeth.

Variation of the male. In a rather small specimen the front angles of the head are blunt, the sides of the head, thorax and elytra are rugose and the mandibles short, with small teeth, placed not far apart. In the larger type-specimen the front angles of the head are sharper, the mandibles are a little longer than the head and each has a strong, rather sharp horizontal tooth internally close to the base, a shorter one at about two-thirds of the length from the base, and a minute one between the last and the apex.

♂. *Length* (with mandibles), 34–45 mm.; (without mandibles) 29–37 mm.; *breadth*, 13–17 mm.

♀. *Length*, 34 mm. ; *breadth*, 16 mm.
DARJEELING DISTR. : Maria Basti, Pedong (*L. Durel*).
Type in the Oberthür collection.

81. **Dorcus arrowi.** (Plate XIII, fig. 6.)

Hemisodorcus arrowi Boil.,* Trans. Ent. Soc. Lond. 1911, p. 441.

♂. Chestnut-red, smooth, shining and unpunctured, with the head, mandibles and pronotum dark brown, the head opaque. The body is rather elongate and the legs are slender. The eyes are small, the *head* has a rather sharp angle before the eye and is gently and evenly narrowed behind. The clypeal process is short and broad, with a minute tooth in the middle. The mandibles of the unique specimen are about twice the length of the head, gently curved and a little flattened. They bear a sharp but not long internal tooth beyond the middle, followed immediately by two similar but smaller teeth. The sides of the *pronotum* are microscopically coriaceous and opaque, the front angles are rather narrowly produced, the lateral margin has a slight angulation before the middle and a strong spiniform tooth beyond it and is strongly concave from the latter to the well-marked basal angle. The *elytra* are very smooth and shining, but bear extremely minute scattered granules, which are rather closer at the sides. The shoulders are sharp. The *mentum* is short and rather finely rugose. The *prosternum* is rather broad and blunt, but a little produced behind. The *metasternum* and *abdomen* are clothed at the sides with pale pubescence. The terminal fork of the front *tibia* is composed of two very short prongs, each with a small tooth at the base, and the lateral teeth are minute. The middle tibia bears a small lateral spine and the hind tibia has none.

Length (with mandibles), 48 mm. ; (without mandibles) 36 mm. : *breadth*, 14·5 mm.
♀. Unknown.
BURMA : Ruby Mines (*W. Doherty*).
Type in the British Museum.

The tip of the front tibia is of peculiar form but it is unfortunate that the only known specimen of the species has only a single foreleg, of which the tibia is imperfect at the extremity.

82. **Dorcus macleayi.** (Plate XIII, fig. 4.)

Lucanus macleayi Hope & Westw.,* Cat. Luc. Coleopt. 1845, p. 19.
Hemisodorcus macleayi Boil., Trans. Ent. Soc. Lond. 1913, p. 248.

Black, with the elytra deep red, their inner and outer margins narrowly and rather indefinitely black. The pronotum and the outer part of the mandibles of the male often tinged with red and the tarsi with conspicuous fringes of reddish or

yellowish hairs. Moderately elongate, with the legs rather stout, the four posterior tibiæ each armed with a strong lateral spine. The prosternum very prominent and bluntly rounded behind. The shoulders of the elytra not sharp and a very short but deep oblique impression at the base of each elytron close to the scutellum. The seventh antennal joint feebly produced.

♀. The upper surface is opaque, with the scutellum and the sutural margins of the elytra shining. The *head* bears two small transversely placed tubercles near the middle and the part in front of these is gently hollowed and almost unpunctured, while the part behind them is irregularly and rugosely punctured. The outer edge of the mandible is almost straight, the tip acutely produced, and there is a strong blunt internal tooth beneath and a smaller one above. The *pronotum* and *elytra* are entirely opaque at the sides, but rather less so towards the middle line of the body and the elytra are densely punctured, except in the anterior dorsal region. The lateral angles of the pronotum are very strongly produced and the sides strongly contracted towards the front and hind angles. The *mentum* is rugosely punctured.

♂. The head, basal part of the mandibles, sides of the pronotum and extreme outer margins of the elytra are entirely opaque. The *head* is flat behind and sloping in front, without sharply defined dividing line, the front angles are sharp, the eyes small and the sides of the head strongly convergent behind the eyes. The clypeal process is strongly transverse, rounded in front. The *pronotum* is finely and densely granular and subopaque dorsally, the front angles are bluntly produced, the sides diverging to well beyond the middle, where there is a very sharply produced angle, and concave and strongly convergent to the rounded hind angles. The *elytra* are finely coriaceous and rather shining.

Variation of the male. In small males the mandibles are short and broad, strongly and regularly curved externally, acutely pointed, with an obtuse rudiment of a tooth near the middle of the inner edge. In large males the mandibles are long, the middle part is almost straight, the tooth is small but sharp and placed beyond the middle and another similar tooth appears before the tip, the two teeth connected by a rather sharp ridge.

♂. *Length* (with mandibles), 32–59 mm. ; (without mandibles) 27–43 mm. ; *breadth*, 11·5–17 mm.

♀. *Length*, 29–40 mm. ; *breadth*, 11·5–16 mm.

SIKKIM : Gnatong (July). DARJEELING DISTR. : Lepchajagar, 7000 ft. (*J. C. M. Gardner*, Sept.). ASSAM. UPPER BURMA : Nam Tamai Valley, 3000 ft. (*R. Kaulback*, July).

Type in the Hope Dept., Oxford University Museum.

D. macleayi has a close resemblance to *D. donckieri*. The mandibles are alike in the males of both but the much broader prothorax of *D. donckieri* renders them easy to distinguish. The slight oblique impression at the base of each elytron is a distinctive feature of *macleayi* in both sexes, as is the form of the prosternum, which is much more elevated and almost compressed behind.

83. **Dorcus donckieri.** (Plate XIII, fig. 5.)

Hemisodorcus donckieri Boil., Bull. Soc. Ent. France, 1898, p. 227, fig.

Black, with the elytra deep red, their inner and outer margins narrowly and rather indefinitely black. The tarsi bear conspicuous fringes of yellow hairs. Rather massive, with the pronotum short and broad, the upper surface dull, but the scutellum shining. The prosternal process long, but very bluntly rounded at the end. The shoulders of the elytra rounded. The sides of the mesosternum strongly punctured and those of the metasternum densely rugose.

♀. The *head* is entirely opaque and coarsely unevenly rugose, with two small transversely placed tubercles in the middle. The mandible is almost straight externally, produced at the tip, and bears a sharp internal tooth above and a blunt one beneath. The *pronotum* is entirely opaque, with its front and lateral margins rather coarsely rugose. The sides are regularly rounded and the basal angles broadly rounded. The *elytra* are densely punctured, the punctures rather strong upon the outer half, fine and less close upon the sutural region. The four posterior *tibiæ* have each a lateral spine, that of the middle tibia very strong.

♂. The upper surface is opaque, except the mandibles, scutellum and the sutural margins of the elytra. The *head* is broad in front, the eyes are small, the front angles of the head obtuse and the sides strongly convergent behind the eyes. The posterior part is flat, the anterior part sloping, the two regions divided by a sharp curved ridge. The clypeal process is sharply angular in front. The head and pronotum are densely granular, without punctures. The front angles of the *pronotum* are very blunt, the lateral margins dilated and a little hollowed, diverging to the lateral angles, which form very strong lobes almost continuous with the base, which is gently sinuate on each side, without distinct angles. The *elytra* are finely coriaceous and dull, but a little smoother close to the suture, where there are fine, rather indistinct punctures. The middle *tibia* bears a fairly strong lateral spine and the hind tibia is unarmed.

Mandibles of the male. I have seen only large examples, in which the mandibles are long, a little curved downwards,

gently rounded at the base and apex and nearly straight between them, with a strong, sharp, oblique internal tooth before the middle, a slightly irregular ridge just before this and another short sharp tooth a little before the tip.

♂. *Length* (with mandibles), 73 mm.; (without mandibles) 51 mm.: *breadth*, 24 mm.

♀. *Length*, 44 mm.; *breadth*, 18 mm.

NEPAL.

Type in the Paris Museum.

Only the unique type-specimen of this species appears to have been known hitherto. The recorded habitat is "Hymalaya" but a single male in the British Museum is from Nepal. A single female specimen (described above) from N. India, bearing the collector's name, E. J. Garwood, almost certainly belongs to the species.

84. **Dorcus nepalensis.** (Plate XIII, figs. 1–3.)

Lucanus nepalensis Hope,* Gray's Zool. Misc. 1831, p. 22.
Hemisodorcus nepalensis Thoms., Ann. Soc. Ent. Fr. 1862, p. 421; Parry, Trans. Ent. Soc. Lond. 1864, p. 86; Boil., *op. cit.* 1913, p. 247.
Lucanus rafflesi Hope,* Trans. Linn. Soc. Lond. xviii, 1842, p. 588.
♀. *Lucanus similis* Hope,* Gray's Zool. Misc. 1831, p. 22.
Lucanus parryi Hope,* Proc. Ent. Soc. Lond. 1843, p. 94; Hope & Westw., Cat. Luc. Col. 1845, p. 20.

Jet-black, extremely smooth and shining above and beneath, with the exception of the head, the sides of the pronotum and, in the female, the sides of the elytra. The soles of the tarsi closely clothed with golden hairs and the sides of the metasternum bearing a very scanty and inconspicuous clothing of minute yellow setæ. Rather long and narrow, moderately convex, with the legs rather long. The ocular canthus sharply angular in front of the eye. The sides of the pronotum microscopically coriaceous and sooty, the scutellum bearing a few fine punctures and the elytra glossy, very minutely and lightly punctured. The prosternum broad and rounded behind. The sides of the metasternum fairly closely punctured and the abdomen very smooth.

♀. The *head* is coarsely rugose, except in front, and bears a single rather strong tubercle in the middle. The canthus is a little prominent laterally in front of the eye. The clypeal process is small and bluntly bilobed. The mandibles are placed rather far apart at the base; they are narrower than usual and almost straight externally. There is a strong tooth on the upper surface just beyond the base, directed obliquely forward and a minute one at the inner edge before the tip. The *pronotum* is very glossy in the middle, but becomes entirely opaque at the sides. The lateral margin is gently curved to the lateral angle, which is not very sharp. The *elytra* are very finely and

rather closely punctured, but very glossy upon the inner part, the punctures becoming gradually more dense towards the sides and apices, which are opaque. The front *tibia* is fairly strongly toothed externally and forked at the end and the middle and hind tibiæ have each a strong lateral spine.

♂. The *head* is broad, microscopically granular above, with the mandibles rather long and far apart at the base. The clypeal process is broad, a little produced in the middle, with a close marginal fringe of yellowish hairs. The eyes are small, but fairly prominent, the canthus acutely angular in front but not produced, and the sides of the head strongly convergent behind the eyes. The *pronotum* is rather short and broad, microscopically granular but moderately shining, except at the sides, the lateral margins more or less straight and diverging gradually from the blunt front angles to the sharp lateral angles, which are placed far back, continuing in a straight line to the almost obsolete hind angles. The *elytra* are entirely glossy. The front *tibia* is long and finely toothed externally, the middle tibia bears a strong lateral spine and the hind tibia a minute one or none.

Variation of the male. In small specimens the head is not very broad and is conspicuously punctured at the sides. The mandibles are short, rounded externally and very sharply pointed and simple, except for a very blunt vestige of a tooth near the middle of the inner edge. In larger examples the head becomes relatively broader and shorter, the punctures diminish and disappear, the mandibles are nearly straight, except near the base and tip, and the tooth is found a little past the middle and is small but sharp. In large specimens another and smaller tooth appears beyond the first and the extremity is bluntly barbed. The mandibles may reach a length of about 27 mm.

♂. *Length* (with mandibles), 32–70 mm. ; (without mandibles) 28–49 mm. : *breadth*, 12–21 mm.

♀. *Length*, 34–47 mm. ; *breadth*, 13–19 mm.

N.W. Frontier Prov. : Thobba, Murree Hills (*Maj. Howland Roberts*). United Prov. : W. Almora, Kumaon (*H. G. Champion*, Aug.). Nepal. Punjab : Naini Tal (*H. L. Andrews* ; *P. V. Isaac*, July). Darjeeling Distr. : Kurseong, 6000 ft. (*E. A. D'Abreu*, Jan.). Assam.

Types of *nepalensis* and *similis* Hope in the British Museum ; of *parryi* and *rafflesi* in the Hope Dept., Oxford University Museum.

85. Dorcus wardi.

Dorcus wardi Arrow,* Proc. Ent. Soc. Lond. B 12, 1943, p. 136.

Black and very shining, with the mandibles, head and pronotum of the male duller but smooth ; the head of the female rather roughly and irregularly punctured and the external part

of the elytra broadly and very densely punctured and opaque. The body rather narrowly elongate, parallel-sided and convex; the sides of the elytra almost straight and the shoulders not sharply angular. The ocular canthus reaching the middle of the eye. The middle tibia bearing a strong lateral spine and the hind tibia a feebler one.

♀. The *head* bears a pair of transversely placed tubercles ; it is a little hollowed and rather finely and closely punctured in front of these and less finely and more irregularly punctured behind them. The posterior part is smooth and shining and the sides are closely rugose. The *pronotum* is very smooth and shining, except at the lateral margins, where it is rugosely punctured. The front angles are bluntly produced, the sides gently rounded to the lateral angle and from there abruptly contracted to the base.

♂. The *head* is short, almost as wide as the pronotum, the lateral angles are sharp but not produced and the sides are contracted behind the eyes. The entire upper surface is unpunctured and very smooth. The mandibles are far apart at the base, flat, gently curved externally, with a short, broad, two-pointed interior lobe situated nearer the tip than the base. The *pronotum* is short and broad, its lateral angles rather sharp.

♂. *Length* (with mandibles), 39 mm. ; (without mandibles) 30 mm. : *breadth*, 13 mm.

♀. *Length*, 28–30 mm. ; *breadth*, 11·5–12·5 mm.

Upper Burma : Seinghku Valley, 9500 ft. (*F. Kingdon Ward*, July). S.E. Tibet : Zayul, Di Chu Valley, 11,000 ft. (*F. Kingdon Ward* and *R. J. Kaulback*, August).

Type in the British Museum.

This is closely related to two species of South-western China, *D. sinensis* Boil. and *D. semenowi* Jakowl., but the lateral angulation of the pronotum is sharper in both sexes, the anteocular angle of the head in the male is sharp, the front angle of the pronotum is blunt and not produced and the sides are evenly curved to the lateral angle. In the female the sides of the pronotum are more rugose than in the related species. The mandibles of the male are relatively broader and the narrow inner branch found in the related species is replaced by a broad dilatation at the same point.

86. **Dorcus westwoodi.** (Plate XIV, figs. 3, 6.)

Hexarthrius westwoodi Parry,* Proc. Ent. Soc. Lond. 1862, p. 108.
Rhætus westwoodi Parry, Trans. Ent. Soc. Lond. 1864, p. 11, pl. 9, figs. 2 & 8 ; Westw., *op. cit.* 1871, p. 355 ; Boil., Mem. Soc. Ent. Belg. ix, 1902, p. 47, pl. 2, fig. 1 (♀).
Cladognathus arrowi, ♀, Grvl., Rec. Ind. Mus. xi, 1915, p. 416.

Entirely black, very smooth, almost unpunctured above, of rather narrowly elongate shape, the legs rather slender in both

sexes, the antennæ with the seventh joint a little produced, the prosternum scarcely compressed and not produced.

♀. Narrow, very smooth but not very glossy. The *head* bears very minute scattered punctures, and there is a small depression behind the base of each mandible and a minute posterior median pit. The canthus extends past the middle of the eye but is not very prominent laterally and there is a very small lateral prominence behind the eye. The sides of the *pronotum* and *elytra* are microscopically coriaceous and the former are subopaque. The lateral margins of the pronotum are gently rounded to the very sharp lateral angles and almost straight to the rounded hind angles. The sides of the elytra are rather straight and parallel, and the shoulders are sharp. The *mentum* is coarsely rugose. The *metasternum* and *abdomen* are coriaceous at the sides and smooth in the middle. The front *tibia* is finely serrate externally, with a few rather larger teeth, and the tip is sharply forked.

♂. Very large, rather narrow and parallel-sided, very smooth and shining. The *head* is short and broad, minutely coriaceous, unpunctured, with a slight longitudinal depression along the middle and convex on each side. The eyes are small but very prominent, the canthus inconspicuous, except in front of the eye, where it is sharply angulate, and the sides are strongly contracted behind the eyes. The clypeal process is divided by a sutural line from the front, fringed with reddish hair, produced to a point and angulate on each side of the base. The mandibles are long and slender, very smooth, strongly curved at the base and apex. They are vertically compressed at the base, where they bear a very strong, acutely produced process beneath and a corresponding but rather less strong and sharp process above. They are very finely and irregularly toothed at the inner edge, where there is also a fairly strong tooth placed well beyond the middle, and the tip is forked. The *pronotum* is minutely coriaceous, the front angles are very blunt, the sides gently excised a little behind the angles and sharply angulate at the front and hind limits of the excision, strongly at the latter point. There is another slight but well-marked angulation much behind the middle, and from there the margin is gently rounded to the base. The *elytra* are entirely glossy, their shoulders very sharply angular and the sides rather straight and parallel. The mentum is rather rugosely punctured. The metasternum and abdomen are very smooth and shining. The legs are fairly slender, the front tibia feebly toothed laterally, the middle tibia has a sharp lateral spine and the hind tibia has none.

I have seen no male but the large type-specimen.

♂. *Length* (with mandibles), 85 mm.; (without mandibles) 59 mm.: *breadth*, 25 mm.

♀. *Length*, 35–44 mm. ; *breadth*, 14–17 mm.

DARJEELING DISTR. : Gopaldhara, Rungbong Valley (*W. K. Webb*).

Type in the British Museum.

The habitat of the male specimen, the only one yet described, is not known. The female specimens described by Boileau were supposed to have been brought from Assam, but this does not appear to be certain. The locality given above is that of two females in the British Museum. A similar female was described by Gravely in error as belonging to the form to which he gave the name *Cladognathus arrowi*. It is rather surprising that the very large and striking male of the species should be apparently rarer than the female. The head and mandibles of this remarkable insect show an evident relationship to species of the genus *Hexarthrius*, from which it is excluded by the three-jointed club of the antenna. The antennæ of the type-specimen are incorrectly drawn in the figures given by Parry.

87. **Dorcus foveatus.** (Plate XV, figs. 2–7.)

Lucanus foveatus Hope,* Trans. Linn. Soc. Lond. xviii, 1841, p. 590.
L. astacoides id.,* *l. c.*
L. omissus id.,* *op. cit.* p. 591.
L. fraternus Hope & Westw.,* Cat. Luc. Col. 1845, p. 12.
Cladognathus impressus Wat.,* Trans. Ent. Soc. Lond. 1869, p. 17.
Metopodontus impressus Parry, *op. cit.* 1870, p. 78, pl. 3, fig. 1.
M. poultoni Boil., Bull. Soc. Ent. France, 1911, p. 63, fig.
M. foveatus Boil., Trans. Ent. Soc. Lond. 1913, p. 224 ; Gravely, Rec. Ind. Mus. xi, 1915, p. 417, figs.
M. foveatus, subsp. *birmanicus* Gravely, *op. cit.* p. 418.
M. croceus Did.,* Col. Luc. du Globe, 1929, p. 121, fig.

Brick-red, with the head and pronotum usually darker than the elytra and lower surface, the antennæ, tarsi and extreme edges of head, thorax and elytra almost black ; elongate and moderately convex, with slender legs. The prosternum strongly compressed and a little produced behind. The shoulders of the elytra acutely angular.

♀. The upper surface is shining, the head dark in the region of the eye and the elytral suture rather more conspicuously dark than in the male. The *head* is coarsely rugose in front and strongly and irregularly punctured behind. The canthus is not very prominent laterally and scarcely angular in front. The *pronotum* is very minutely punctured in the middle, the punctures becoming gradually more distinct laterally and rugose at the outer margins. The sides are gently rounded, with a sharp but minute lateral angle far behind the middle. The *elytra* are finely and rather closely punctured dorsally, except at the sutural margin, and the punctures become large and dense at the sides. The lower surface is rather smooth, but the *mentum* is rugose and the tip of the *abdomen* strongly punctured.

The front *tibia* is closely serrate laterally, the extremity is broad and ends in three short lobes.

♂. The surface is dull above and beneath, with the exception of the mandibles and the hollowed anterior part of the head in large specimens. Except upon this part the head is densely granular, the front angles are sharply produced and the eyes are rather prominent. The *head* is produced behind the eyes and the sides are feebly prominent there. The pronotum is very minutely and densely granular, but less densely in the middle than at the sides. The front angles are blunt, the sides scarcely rounded to the lateral angles, which are very acute, and almost straight from there to the base. The *elytra* are dull except at the sutural margin. The *mentum* is densely granular, opaque and very feebly punctured and the *metasternum* and *abdomen* are almost unpunctured. The prosternal process is strong and conical. The front *tibia* is minutely serrate, with small teeth at intervals and the terminal fork is rather narrow. The middle tibia has a minute lateral spine and the hind tibia has none.

Variation of the male. In the smallest male specimens (*impressus* Wat.) the head is short, the mandibles are about as long as the head and serrate at the inner edge, the head is a little hollowed anteriorly but not shining. In rather larger examples a pair of small tubercles become visible just behind the hollowed area. At a further stage a longitudinal groove appears between the tubercles, which now project forward rather strongly. The front of the head becomes more deeply hollowed and very smooth and shining. As the mandibles increase in length the fine serrations of the inner edge become at first more numerous and afterwards, by the gradual disappearance of those in the middle, become divided into two series, a group of about six small teeth close together at the base and about four less crowded ones towards the end. At a further stage most of the small basal teeth also disappear, but the course of development now differs in different regions. The basal teeth generally become resolved into a pair standing side by side and, in the Eastern Himalayas these two teeth persist and, accompanying further increase in the size of the insect, move progressively farther apart, until in the largest specimens the anterior one is a little in front of the middle of the mandible, the other remaining at the base. This is the phase described as a distinct species by Boileau and called *poultoni*. But the basal teeth may resolve themselves into one only and this also, with increasing size of the specimen, moves on towards the other end of the mandible. This phase was called by Gravely the subspecies *birmanicus*, but it is not peculiar to Burma. Burmese and Assamese males develop in this direction and full-sized examples show the single tooth placed in the middle of the

mandible (without the *poultoni* tooth at the base), which is characteristic of the typical phase of *D. foveatus*.

The two tubercles of the head are a little farther apart in large specimens of the *poultoni* phase than in those of the typical phase.

♂. *Length* (with mandibles), 22–60 mm. ; (without mandibles) 19–39 mm. : *breadth*, 8–17 mm.

♀. *Length*, 19–26 mm. ; *breadth*, 9–11·5 mm.

BHUTAN : (*Capt. Pemberton*). DARJEELING DISTR. : Gopaldhara, Rungbong Valley (*W. K. Webb*) ; Pedong (*L. Durel*) ; Mangpu (*E. T. Atkinson*) ; Kurseong, 4500 ft. (*E. A. D'Abreu*, Aug.). ASSAM : Shillong, 5000 ft. (*T. Bainbrigge Fletcher*, June ; *H. M. Parish*, Sept.) ; Manipur (*W. Doherty*). BURMA : Sadon, 3600 ft. (*R. Malaise*, June, July ; Taunggyi, Shan States, 4500 ft. (*R. Malaise*, Aug.). ANDAMAN IS. (*E. T. Atkinson*).

Type in the Hope Dept., Oxford University Museum, also those of *omissus*, *astacoides* and *fraternus* ; those of *poultoni* and *croceus* in the Paris Museum ; that of *impressus* in the British Museum and that of *birmanicus* in the Indian Museum, Calcutta.

Mr. R. E. Parsons has sent me a series of both sexes of this species found by him feeding upon the exuding gummy sap of an old green lime tree (Indian country lemon) in Shillong. He notes that when alive they are of a beautiful golden chestnut colour, but become darker very shortly after death. Dr. Didier's *Metopodontus croceus* is a rather small male specimen which has retained its bright colouring better than usual.

88. **Dorcus castaneicolor**, nom. nov. (Plate XII, fig. 4.)

Tetrarthrius castaneus Did.,* Encyclop. Ent. Col. ii, 1926, p. 29 (preoccupied name).

Chocolate-brown, with the extreme margins of head, thorax and elytra, the tips of the mandibles and the knees black ; the tarsi with brushes of yellow hairs beneath, the body very smooth and shining above and beneath. The form convex, not very elongate. The scutellum rather large, the shoulders of the elytra rounded, the extremities flattened and tapering. The prosternum narrow and vertically prominent between the coxæ but not produced backward. The seventh joint of the antenna a little produced. The hind femora rather clavate, the basal part slender, the tarsi with pads of yellow hair beneath the four basal joints.

♂. The *head* is finely and not closely punctured, a little hollowed obliquely on each side and elevated in a gentle curve in front, the clypeus sloping but reflexed and bilobed at the

front edge. The eyes are very prominent and scarcely at all divided, the canthus strongly angulate in front, the sides of the head convergent behind but with a slight rounded prominence behind each eye. The mandibles are falciform, much longer than the head, very strongly curved, not dilated at the base but moderately broad to beyond the middle, then narrowed, and sharply pointed at the tip. The inner edge has a slight prominence a little before the tip, a sharp tooth near the middle and six or eight slight denticulations between it and the base. The *pronotum* bears fine, unevenly scattered punctures and is very glossy in the middle, slightly opaque at the sides and strongly margined at the sides and base. It is very convex, rather narrow in front with the front angles subacute, the lateral margins diverging and nearly straight from the front angles to the middle, then bent upward and produced to a sharp spine behind the middle, from which it is contracted and concave to the hind angle, which is well marked but not acute. The base is narrower than the elytra at the shoulders. The *elytra* are very smooth and shining, without distinct punctures but with a few incomplete longitudinal striæ. The lower surface is very smooth, the *metasternum* with a median groove but almost devoid of distinct punctures. The front tibia has the terminal fork not much produced and there are about three fine lateral teeth with rather indistinct denticulations between them ; the middle tibia has a minute lateral spine and the hind tibia is unarmed.

The female is unknown.

Length (with mandibles), 26 mm. ; (without mandibles) 20 mm. : *breadth*, 9 mm.

Sikkim.

Type in Dr. Didier's collection.

The name *castaneus*, originally given to this species, having been previously used, it has been necessary to change it.

89. **Dorcus subnitens.** (Plate XII. fig. 8.)

Cyclorasis subnitens Parry, Proc. Ent. Soc. Lond. 1862, p. 112 ; Trans. Ent. Soc. Lond. 1864, p. 42, pl. 7, fig. 1.
Prismognathus subnitens Gravely,* Rec. Ind. Mus. 1915, p. 421.
Prismognathus parvus Did., Col. Luc. du Globe, 1928, p. 79, fig. 38.

Reddish-chocolate, a little lighter upon the elytra, with the lower surface, femora and tibiæ (except the knees) red ; the upper surface with a variable greenish-metallic lustre, the elytra (except at the sides) and sometimes also the median part of the pronotum extremely smooth and shining. Moderately elongate and convex, with the eyes prominent, not very small and scarcely divided by the canthus. The pronotum short and broad, with the base rather narrow and the hind angles sharp.

The elytra very glossy in both sexes, with the sides dull and the shoulders rounded. The prosternum elevated behind and almost vertical but not pointed. The metasternum also a little elevated between the coxæ and vertical in front. The front tibia forked at the end and finely serrate laterally, with a few small lateral teeth, and the hind tibia produced at the end into three sharp terminal processes.

♀. The *head* is shining, rather strongly punctured, very uneven, with a large deep depression on each side in front, the sides oblique before the eyes, without prominences. The mandibles are strongly rounded, laterally compressed, very sharp-pointed, the right mandible strongly and the left feebly bifurcated, and each with a large and very blunt internal tooth. The *pronotum* is very smooth and shining, very convex and finely and sparsely punctured, the sides strongly but not sharply angular behind the middle, rounded in front and concave behind. The *elytra* are very shining, except at the sides, and bear fine scattered punctures, which are rather more numerous near the suture. The middle *tibia* has a lateral spine but that of the hind tibia is almost obsolete.

♂. The *head* is finely coriaceous and dull, the front angles sharp but scarcely produced and the sides rounded behind the eyes. The clypeal process is short and bilobed. The *pronotum* is finely coriaceous and very opaque at the sides, more or less shining, with fine scattered punctures, in the middle. The front angles are bluntly produced, the sides sharply angulate behind the middle and rather sharply at the base, scarcely rounded in front, strongly concave behind. The *elytra* are extremely glossy, except at the sides, where they are dull. The middle and hind *tibiæ* are without lateral spines.

Variation of the male. In small specimens the mandibles are short and rather triangular in shape, the inner edges serrate almost throughout, meeting in a straight line, the tips crossing one another. In the larger typical phase the mandibles are similar, but rather longer, and each shows a strong longitudinal ridge on the upper side, the ridge ending in a strong erect process a little before the tip. Two still larger specimens in the Oberthür collection, which may represent another and distinct phase of the male of this species, have mandibles of quite a different form, nearly twice the length of the head, far apart at the base, strongly curved, of almost even width in the basal half, without longitudinal ridge or erect process above, finely and evenly serrate at the inner edge, with two longer teeth, one at the middle and the other a little before the tip. In correspondence with the separated mandibles the clypeal process is broad, its front edge nearly straight and the angles acute.

♂. *Length* (with mandibles), 15–21 mm.; (without mandibles) 13–17 mm.: *breadth*, 5·5–7 mm.

♀. *Length*, 17 mm. ; *breadth*, 7 mm.

DARJEELING DISTR. : Pedong (*L. Durel*).

Type in the René Oberthür collection ; that of *parvus* Did., in Dr. Didier's collection, co-type in the British Museum.

Parry's type is a male of medium size, the habitat of which was unknown to him. Although the number of examples I have seen is very small, I cannot resist the conclusion that the specimen figured in Plate XII, fig. 8, represents a phase of *D. subnitens*, since it agrees exactly in all respects, except in the form of the mandibles, which certainly differ strikingly from the typical form. If this conclusion is right the form of mandible which was considered to justify the creation of the genus *Prismognathus* is either an intermediate condition or, more probably, one of two alternative phases exhibited by the males of this species.

90. **Dorcus lucidus.** (Plate XII, figs. 2, 3.)

Prismognathus lucidus Boil., Le Naturaliste, xxvi, 1904, p. 278.

Very smooth and shining, light chestnut colour, the pronotum and elytra of the female dark chocolate and those of the male yellow, the pronotum with a dark longitudinal median line a little dilated in the middle, and a dark marginal spot on each side, the elytra with the sutural margins dark. The body convex and rather elongate. The eyes prominent and scarcely at all divided. The prosternum elevated and prominent between the coxæ, quadrate and vertical in front. The metasternum also a little elevated between the middle coxæ.

♀. The upper surface is very glossy, with the sides of the thorax and elytra opaque. The *head* is rather strongly punctured and very uneven, with a rather large hollow on each side near the eye. The clypeal process is rather large and nearly semicircular. The mandibles are long and very strongly rounded but not broad, so that a gap is always visible between them. Each has a sharp internal tooth beneath, near the base, and the right one has another on the upper edge towards the tip. The *pronotum* bears numerous fairly strong punctures, which become feebler and less close towards the sides. The front angles are a little produced, the lateral margins gently curved to beyond the middle, where there is an obtuse angle, and feebly concave to the hind angles, which are very obtuse. The *elytra* are scarcely perceptibly punctured, except behind the scutellum. The teeth of the front *tibia* are sharp, the middle tibia has a strong lateral spine and the hind tibia a rather feeble one.

♂. The head and the sides of the pronotum are opaque. The *head* bears fine scattered punctures, which are inconspicuous,

except behind the eyes. The front angles are acute and produced obliquely, the front margin is curvilinearly excised, the upper surface flat, and the sides are a little contracted behind the eyes. The clypeal process is short and trilobed. The *pronotum* bears moderately fine scattered punctures, its front angles are bluntly produced, the sides straight to beyond the middle, where they are very bluntly angular, and feebly concave to the hind angles, which are also very blunt. The *elytra* bear only a few indistinct punctures and are smooth and shining everywhere. The front *tibia* has two sharp lateral teeth in addition to the terminal fork, and the middle and hind tibiæ are without visible spines.

Variation of the male. In a small male the mandibles, which curve gently upwards, are about as long as the head, the outer edge is gently rounded and the inner edge serrate from the base to near the tip, with a slightly prominent tooth in the middle. In a large specimen the mandibles are half as long again as the head, the outer edge is nearly straight to near the tip, the inner edge has two small teeth near the base, followed after a short interval by closely-set uneven teeth, the first larger than the rest, to near the tip. The upper surface bears two converging ridges, which unite just before the tip to form a strong process pointing obliquely forward.

♂. *Length* (with mandibles), 21–25 mm, ; *breadth*, 7–8 mm.

♀. *Length*, 18 mm. ; *breadth*, 8 mm.

BHUTAN : Pankasary Hill. SIKKIM : Gnatong (Aug.) ; between Padamtsin and Lingtoo (July).

Type in the Paris Museum.

91. **Dorcus platycephalus.** (Plate XII, fig. 1.)

Lucanus platycephalus Hope,* Proc. Ent. Soc. Lond. 1842, p. 83 ; Westw., Cab. of Oriental Ent. 1848, p. 17, pl. 8, fig. 2.

L. (subg. *Cyclopthalmus*) *platycephalus* Hope & Westw., Cat. Luc. Col. 1845, p. 5.

Cyclorasis platycephalus Thoms., Ann. Soc. Ent. France (4) ii, 1862, p. 397.

Prismognathus platycephalus Boil., Trans. Ent. Soc. Lond. 1913, p. 234.

Black or very dark brownish-black, with a slight metallic lustre upon the elytra, which are very glossy, except at the sides, the head and the sides of the pronotum and elytra dull. Small, convex and not very elongate. The eyes prominent and scarcely at all divided by the canthus. The clypeal process short, broad and trilobed. The mandibles widely separated at the base. The shoulders of the elytra rather obtusely angulate. The prosternum strongly elevated and compressed behind and rather sharply angular.

♀. The *head* is narrow, very coarsely, closely and roughly punctured, the canthus very small and the front angles very obtuse. The mandibles are laterally compressed and narrow, strongly curved and bifurcate at the end, the tips sharp, the lower one longer than the upper. The middle of the clypeal process is slightly prominent. The *pronotum* is shining, but strongly and rather closely punctured, the punctures coarser and more irregular at the sides. The front angles are blunt, the sides nearly straight to beyond the middle, where they are strongly but not acutely angulate, and nearly straight to the hind angles, which are well marked but obtuse. The *elytra* are finely punctured, with wide opaque outer margins. The front *tibia* is sharply tridentate at the end.

♂. The *head* is flat and rather opaque above, the front margin scarcely excised, the front angles strongly produced outwards and very sharp, the sides converging behind the eyes. The upper surface bears fine scattered punctures. The outer lobes of the clypeal process are a little more prominent than the median part. The mandibles are scarcely longer than the head, strongly and regularly rounded. The *pronotum* is finely and unevenly punctured, more strongly and closely near the base, especially near its middle, and the sides are broadly opaque. The front angles are blunt and not produced, the sides are nearly straight to beyond the middle, where they are strongly but not sharply angulate, and feebly concave to the well-marked but not sharp hind angles. The *elytra* bear very irregular fine and scanty punctures. The front *tibia* bears a few very sharp lateral teeth, the middle tibia has a very minute lateral spine and the hind tibia has none.

Variation of the male. In a small specimen the head is small, the eyes are very prominent, the mandibles flat and rather broad but well separated at the base, with the inner edges irregularly toothed and the apices very sharp. In larger males the mandibles are less flat and a little compressed and a strong vertical tooth appears upon the upper edge before the tip. At a more advanced stage the head is very broad, the eyes are less prominent, the mandibles rather narrow and without teeth in the basal half, vertically dilated in the terminal part, which is divided into three nearly equal finger-like branches, with a few minute teeth between the middle and lower branches.

♂. *Length* (with mandibles), 16–26 mm.; (without mandibles) 15–21 mm.: *breadth*, 7-10 mm.

♀. *Length*, 18 mm.; *breadth*, 8 mm.

Darjeeling Distr. Assam: Khasi Hills (*Dr. Cantor*).

Type in the Hope Dept., Oxford University Museum.

Genus **AULACOSTETHUS**.

Aulacostethus Wat., Trans. Ent. Soc. Lond. 1869 p. 13 ; Parry, *op. cit.* 1870, p. 83.

Type, *A. archeri* Wat.

Range. Sikkim.

Body moderately elongate, compact and convex, rather parallel-sided, the middle and hind legs very short, their tibiæ each with a strong lateral spine and the extremities dilated and produced externally into three sharp finger-like processes, the front tibia with a strong terminal fork ; tarsi short, the pulvillus well developed. Head (♂) quadrate, broad, with the eyes greatly reduced, divided by a very narrow longitudinal ridge, the upper and lower divisions very small, the upper minute Antenna fairly slender, with the seventh joint strongly transverse and the last three not very short. Maxilla with the outer lobe long and slender, the inner without horny hook (♂) ; the palpus long, the second joint very slender. Mentum broadly triangular ; ligula long and narrow, forming two slender diverging lobes in front, the inner edge closely fringed with long hairs ; palpi with the first and third joints long. Pronotum completely and narrowly margined, broad, with the lateral margin obtusely angulate behind and the hind angles obsolete. Scutellum broadly semicircular. Prosternum channelled between the front coxæ, produced behind, a little compressed, blunt.

♂. Mandibles narrow, far apart at the base.

♀. Unknown.

The validity of this genus was questioned by Parry, who compared *A. archeri* with *Dorcus forceps* Voll., in which the eyes are almost, though not completely, divided, but there is certainly no very near relationship with that insect and the remarkable reduction of the eyes to mere vestiges, not raised either dorsally or ventrally above the general surface of the head, separates this apparently rare insect from all other known forms. This feature, together with the peculiar form of the legs, seems to indicate that its habit is to bury itself and shun the light. It is to be feared that the discovery of the female, necessary for a better knowledge of its affinities, may be long delayed but it is probable that the fossorial character of the short legs of the male will prove to be still more pronounced in the other sex and the generic separation of the insect will prove to be justified.

92. **Aulacostethus archeri.** (Plate XXI, figs. 7, 8.)

Aulacostethus archeri Wat.,* Trans. Ent. Soc. Lond. 1869, p. 14, pl. 3, fig. 1.
Prosopocoilus archeri Parry, *op. cit.* 1870, p. 83.

♂. Black, not shining above, moderately shining beneath, the sides of the metasternum clothed with rather long and close

yellow hair. The *head* is flat, very finely coriaceous above, except at the sides, which are coarsely rugose. The front margin forms a prominent trisinuate ridge, the lateral margins are nearly straight and parallel, very feebly swollen just in front of the pronotum. The *pronotum* is smooth, with a rather narrow densely punctured or rugose band almost completely surrounding it, but interrupted in the middle of the front margin. The front angles are a little produced but blunt, the sides nearly straight, the lateral angles very well marked but not acute. The *elytra* are also smooth, with a narrow rugose strip at the base, and the shoulders are sharply angular. The hairy sides of the *metasternum* leave a well-defined bare median space, triangular in shape, which is smooth and shining but with minute scattered punctures at the sides. The *abdomen* is very smooth beneath.

Variation of the male. In a rather small male specimen found by Mr. H. G. Champion at Pemayangtse the head is strongly transverse, the mandibles are not longer than the head but narrow, strongly curved and tridentate, the pronotum is scarcely broader than the head and its sides are straight and parallel. In the large type-specimen the head and pronotum are very broad, the head relatively longer and the pronotum shorter, the mandibles long and slender, gently curved, forked at the tip, with a fairly strong triangular internal tooth a little beyond the base, the sides of the prothorax feebly concave, converging towards the lateral angle. The front tibiæ are rather more slender.

♂. *Length* (with mandibles), 33–50 mm.; (without mandibles) 29–37 mm.: *breadth*, 13–15·5 mm.

SIKKIM: Pemayangtse, 6000 ft. (*H. G. Champion*, May).

Type in the British Museum.

The habitat of the type-specimen was given as North India and possibly Kashmir, but the discovery of a second example in Sikkim renders the suggested locality very improbable.

Genus **ÆGUS.**

Ægus Macl., Horæ Entom. i, 1819, p. 112; Arrow, Trans. R. Ent. Soc. lxxxiii, 1935, p. 113.

TYPE, *Ægus chelifer* Macl. (Malaya).

Range. The Indo-Malayan, Papuan and Polynesian Region.

Male and female dissimilar. Body generally compact, with rather short but not stout legs and antennæ, the club of the latter composed of three short joints, the seventh joint sometimes slightly produced. Canthus meeting the gena and completely dividing the eye into upper and lower halves. Clypeus very short. Maxilla not very long, the inner lobe without chitinous hook, the maxillary palpus with the first

and third joints short. Mentum very broad, concealing the ligula. Ligula with short widely diverging lobes, the labial palpi long, with the basal joint slender, the second short and the third oval. Prosternum scarcely elevated behind the front coxæ, not compressed nor produced. Front tibia with terminal fork and fairly numerous lateral teeth, the middle and hind tibiæ usually with two or more small lateral spines. Claws and pulvillus long. Scutellum short and transverse. Elytra longitudinally striate, the dorsal striæ six in number.

The mandibles of the female are simple, short and broad. Those of the male are longer but never extremely long, simply curved, often toothed but not branched.

Ægus is nearly related to *Dorcus*, but is distinguished by the completely divided eyes and usually by the occurrence of several fine lateral spines upon each of the four posterior tibiæ. Another important distinction is found in the grooved elytra. In *Dorcus* grooved elytra are rare and the grooves, when present, are more numerous and less regular.

A species referred to this genus as *Ægus interruptus* was described in a few words by Macleay as doubtfully Indian (Macleay, Horæ Entom. 1919, p. 113). The type, if still in existence, is in the Macleay Museum in Sydney, N.S.W., and as it is impossible to identify the species it is best ignored.

Key to the Species of Ægus (males).

1	(6)	Head more or less hollowed in front.	
2	(5)	Sides of the elytra not broadly flattened nor very closely punctured.	
3	(4)	Elytral striæ fine, not distinctly punctured	*chelifer* Macl., p. 176.
4	(3)	Elytral striæ coarser, closely punctured.	*ræpstorffi* Wat., p. 178.
5	(2)	Sides of the elytra broadly flattened, very closely punctured	*kandiensis* Parry, p. 178.
6	(1)	Head not hollowed in front.	
7	(12)	Upper surface of the body rather flat.	
8	(9)	Front margin of the head angularly excised	*labilis* Westw., p. 181.
9	(8)	Front margin of the head very feebly excised.	
10	(11)	Sides of the pronotum rugose	*parallelus* Hope, p. 179.
11	(10)	Sides of the pronotum punctured ...	*eschscholtzi* Hope, p. 182.
12	(7)	Upper surface convex	*linealis* Did., p. 183.

Key to the Species (females).

1	(8)	Elytra very closely sculptured, not shining.	
2	(7)	Head not smooth.	
3	(4)	Pronotum bearing numerous rather fine punctures	*chelifer* Macl., p. 176.
4	(3)	Pronotum entirely rugose.	
5	(6)	Pronotum not very coarsely rugose ..	*kandiensis* Parry, p. 177,

6	(5)	Pronotum very coarsely rugose	*ræpstorffi* Wat., p. 178.
7	(2)	Head smooth	*parallelus* Hope, p. 179.
8	(1)	Elytra more or less shining, not very closely sculptured.	
9	(10)	Head rugose	*labilis* Westw., p. 180.
10	(9)	Head distinctly punctured	*linealis* Did., p. 182.

The ♀ of *Ægus eschscholtzi* Hope is unknown.

93. Ægus chelifer.

Ægus chelifer Macl.,* Horæ Entom. 1819, p. 113.
Ægus nitidus Boil.,* Bull. Soc. Ent. France, 1899, p. 321.

Black, smooth and shining in large males or with the head and pronotum dull, closely sculptured and dull in females and small males, with a clothing of minute erect setæ and sometimes with a covering of grey adherent earthy matter in the females. The legs clothed with short pale hairs, the middle and hind tibiæ bearing two or three small lateral spines. The body a little depressed and the base of the pronotum straight and distinctly narrower than the elytra.

♀. Oval in shape, with the upper surface closely sculptured and dull. The *head* is very strongly and closely punctured. The mandible has a strong truncate tooth near the middle and the clypeal process is rather broad and emarginate. The *pronotum* is strongly and closely punctured, with the sides broadly rugose. The front angles are bluntly produced, the sides evenly rounded and the hind angles obtuse. The *elytra* are finely striate, with the intervals flat and finely and closely longitudinally rugose. The shoulders are sharp and the sides rounded. The mentum is very coarsely rugosely punctured. The lower surface of the *body* is shining but strongly punctured, the last sternite very coarsely and closely.

♂. The body is depressed ; the *head* is more or less hollowed in front, with the hinder edge of the hollow a little produced, except in very small specimens. The clypeal process is bilobed. The sides of the head, except in very small specimens, are prominent behind the eyes. The sides of the *pronotum* are rather straight and parallel, with the front angles truncate or bluntly produced, the hind angles obtuse but distinct and the base nearly straight. The *elytra* are finely but rather deeply striate, except at the sides, where they are finely and closely punctured, the shoulders are sharply angulate and the sides rounded and a little flattened. The *lower surface* is very shining but well punctured, the last sternite finely and closely punctured and setose.

Variation of the male. Small males, like the females, are closely punctured above and not shining. The head and pronotum are coarsely punctured, rugosely at the sides, and the elytra finely and closely. The head is not very broad and

the sides are scarcely prominent behind the eyes. The mandibles are of simple falcate shape. The puncturation diminishes with increase of size, disappearing first from the inner half of the elytra and at a later stage from the pronotum. In medium-sized examples, the front of the head is more produced above the excavation, its sides are more prominent behind the eyes and a small internal tooth appears before the middle of the mandible. In large specimens the head is smooth and dull, with a short triangular process in front, widest behind the eyes, where it is roughly punctured, the pronotum is also smooth and dull, except for a few punctures in the marginal groove, and the elytra are smooth and shining except at the sides. The front angles of the pronotum are obliquely truncate. The mandibles may reach a length nearly twice that of the head and the tooth is found near the middle in the largest specimens, but before it in smaller ones.

♂. *Length* (with mandibles), 14–36 mm.; (without mandibles) 13–26 mm.: *breadth*, 5·5–12·5 mm.

♀. *Length*, 17–21 mm.; *breadth*, 7·5–10 mm.

Bengal: Mankidoania, Sunderbans (*C. F. C. Beeson*, Feb.). Burma: Rangoon (*E. T. Atkinson*). Tonkin. Malay Peninsula. Sumatra. Borneo. Philippine Is.

Type in the British Museum; also co-types of *Ægus nitidus* Boil.

This and the next two species are particularly difficult to define, on account of the remarkable changes, depending upon their size, to which the males are subject. They are all very closely related to *Ægus acuminatus* F. They may even be found ultimately to be local races of that species.

94. **Ægus kandiensis.** (Plate XXII, figs. 12–14.)

Ægus kandiensis Parry, Trans. Ent. Soc. Lond. 1864, p. 53; *op. cit.* 1870, p. 61, pl. 2, figs. 5 & 8.

Black, very smooth and shining in large males, or with the head and pronotum opaque, entirely dull and opaque in females and small males, with a clothing of minute erect setæ and sometimes with a covering of grey adherent earthy matter in the female. The legs clothed with short pale hairs, the middle and hind tibiæ bearing two or three small lateral spines. The body a little depressed and the base of the pronotum straight and distinctly narrower than the elytra.

♀. Oval in shape, with the upper surface closely sculptured and dull. The *head* is very coarsely and rugosely punctured and the front part of the clypeus is concave. The mandible has a strong truncate tooth near the middle. The *pronotum* is rugosely punctured, more finely and densely at the sides than in the dorsal part. The front angles are bluntly produced,

the sides evenly rounded and the hind angles obtuse. The *elytra* are finely striate, with the intervals flat and closely longitudinally rugose. The shoulders are sharp and the sides rounded. The *mentum* is very coarsely rugosely punctured. The lower surface of the body is shining but strongly punctured, the last abdominal sternite very coarsely and closely.

♂. The body is depressed and rather parallel-sided, the *head* more or less hollowed in front, with the hinder edge of the excavation a little produced, except in very small specimens. The clypeal process is bilobed. The sides of the head, except in very small specimens, are prominent behind the eyes. The sides of the *pronotum* are rather straight and parallel, with the front angles obliquely truncate or bluntly produced, the hind angles distinct but obtuse. The *elytra* are finely and deeply striate, except at the sides, where they are finely and closely punctured and rather dilated. The shoulders are sharply angulate and the sides rounded. The *metasternum* is strongly punctured, the *abdomen* almost smooth, except upon the last sternite, which is very closely punctured and setose.

Variation of the male. As in *Ægus chelifer*, but in large males the anterior process of the head is rather more produced and the mandibles are rather broader, flatter and less slender.

♂. *Length* (with mandibles), 14–34 mm.; (without mandibles) 13–24 mm.: *breadth*, 6–12 mm.

♀. *Length*, 17–22 mm.; *breadth*, 8–9·5 mm.

Ceylon: Kelani Valley, near Colombo (*W. Braine*); Kandy (*G. E. Bryant*, June, *E. E. Green*, Oct.); Dikoya, 3800 ft. to 4200 ft. (*G. Lewis*, Feb.); Maskeliya (March, April; Badulla (April); Wellawaya (July); Maha Oya (July); Mousakande (July); Madulsima (Sept.); Urugalla (Sept.); Ratnapura (Dec.); Weligama (Dec.); Ingiriya (Jan.); Giriulla (Feb.).

Type in the René Oberthür collection.

This is a very abundant species in Ceylon. It has been found in rotten logs at all seasons by Mr. G. M. Henry.

95. Ægus rœpstorffi.

Ægus rœpstorffi Wat.,* Ann. Mag. Nat. Hist. (6) v, 1890, p. 36.

Black, the large males very smooth and shining, with the head and pronotum opaque, the females and small males entirely dull, the latter having an exceedingly fine and inconspicuous clothing of minute erect setæ.

♀. Like that of *A. kandiensis*, but with the *pronotum* more coarsely rugose, usually with a small smooth shining area in the middle.

♂. Like that of *A. kandiensis*, but with the *elytra* less finely striate, the striæ containing fine closely contiguous punctures, and the sides not very closely punctured.

Variation of the male. As in *A. kandiensis.* In large males the mandibles are generally rather more slender and the tooth at the middle of the inner edge is minute.

♂. *Length* (with mandibles), 14–30 mm.; (without mandibles) 12–22 mm.: *breadth*, 6–11 mm.

♀. *Length*, 18–20 mm.; *breadth*, 5·5–8·5 mm.

Andaman Is. Nicobar Is.

Type in the British Museum.

96. **Ægus parallelus.** (Plate XXII, figs. 17–19.)

Lucanus parallelus Hope & Westw.,* Cat. Luc. Col. 1845, p. 22.
Lucanus capitatus Westw., Trans. Ent. Soc. Lond. iv, 1847, p. 275, pl. 20, fig. 5.
Lucanus malabaricus Westw., *op. cit.* p. 276, pl. 20, fig. 7.
Dorcus parallelus Westw., *op. cit.* 1864, p. 56.
Ægus parallelus Boil., *op. cit.* 1913, p. 257; Arrow, *op. cit.* lxxiii, 1935, p. 114.

Black, the male shining above, the female dull, the body rather broad and flat, the legs and lower surface sometimes dark red, the front tibiæ bearing rather closely-set, short sharp teeth and the middle and hind tibiæ each bearing two sharp lateral spines.

♀. Oval, less flattened than the male, with the upper surface strongly and closely punctured, except the middle of the head. The *head* is broad, smooth and opaque in the middle, roughly punctured on each side, and upon a hollow area in front. The canthus is rather prominent laterally. The mandibles are strongly toothed at the inner edge, the tooth of the right mandible simple, that of the left double. The *pronotum* is strongly punctured, except in front of the middle, the punctures dense and confluent at the sides. The lateral margins are gently rounded, the front angles bluntly produced and the hind angles obtuse. The *elytra* each bear six dorsal striæ and two lateral ones and are closely and finely punctured, with the alternate intervals raised. The sides are more densely and rugosely punctured. The *mentum* is rugosely punctured. The lower surface of the body is evenly punctured.

♂. Broad, flat and rather shining. The *head* is very broad, flat and opaque, with a small tooth on each side behind the mandibles, the sides more or less punctured behind, the front margin gently excised, the sides of the head nearly straight, with a slight angulation behind the eye. The *pronotum* is short and broad, generally smooth, the entire margin surrounded, except in the middle of the front, with a finely rugose band. The sides are straight, the front angles bluntly produced and the hind angles rounded. The *scutellum* is finely punctured. The *elytra* are smooth and shining, with six deep dorsal striæ and two faint lateral ones, the sides very densely punctured

and rather flat. The shoulders are acute. The *mentum* and *submentum* are smooth, or feebly punctured, and opaque. The *metasternum* is feebly punctured in the middle and closely rugulose at the sides.

Variation of the male. In small specimens the head and pronotum are closely punctured and more or less shining; the frontal tooth behind the base of the mandible is absent and the latter has only a rudimentary tooth at the base above. The pronotum has a rather well-marked median depression. In larger males the puncturation is restricted to the sides of the head and pronotum and the mandibles have a short but well-marked tooth at the base of each. At a further stage the head and pronotum are very smooth, the former very dull, and the mandibular tooth is situated farther from the base. In the largest specimens the pronotum as well as the head is opaque, the mandibular tooth is placed obliquely near the middle and is fairly long; the two cephalic teeth are short but sharp.

♂. *Length* (with mandibles), 23–50 mm.; (without mandibles) 20–35 mm.: *breadth*, 9–17 mm.

♀. *Length*, 22–26 mm.; *breadth*, 9·5 to 10·5 mm.

ASSAM. MALAY PENINSULA. SUMATRA. BORNEO. JAVA.

Type in the Hope Dept., Oxford University Museum.

This species probably occurs within our region, although the Indian records are unreliable. It was originally attributed to Assam and a female specimen described two years later was called *malabaricus* in the certainly erroneous belief that it came from Malabar. The species will probably be found in Tenasserim, but there is at present no actual warrant for including it as an Indian insect. As it is liable to be confused with *Ægus labilis* Westw. it seems desirable to include both forms here.

97. **Ægus labilis.** (Plate XXII, figs. 15, 16, 20.)

Ægus labilis Westw.,* Trans. Ent. Soc. Lond. 1864, p. 54, pl. xii, fig. 5; Gravely, Records Ind. Mus. xi, 1915, p. 426.

Black, the elytra more or less shining, with the outer margins opaque and sooty, the shape rather broad and depressed. The front tibiæ serrate at the outer edge, with about five larger teeth; the middle tibiæ bearing two or three spines and the hind tibia one or two. The legs sometimes in part of a deep red colour.

♀. Oval in shape and less depressed than the male, with the upper surface shining. The *head* is very coarsely and rugosely punctured, with a transverse depression on each side behind the base of the antenna. The mandibles have each a large right-angled tooth at the lower edge and in the closed position a space is enclosed behind the teeth. The *pronotum* is coarsely and unevenly punctured, rugosely at the sides, and has an oval

strongly punctured depression in the middle. The sides are straight and convergent in front, with acutely produced angles, and strongly rounded behind, without angles. The *scutellum* is strongly punctured. The *elytra* are very deeply striate, the intervals equal and finely punctured and the sides and apices densely rugose. The *mentum* is very coarsely rugose.

♂. Shape, broad and flat. The *head* is very broad and flat, without excavation or median projection, finely coriaceous and opaque, with fine and inconspicuous scattered punctures at the sides, the front margin nearly vertical, its front edge strongly subangularly emarginate, with the extremities of the emargination acutely produced, the sides of the head nearly straight and parallel, with a very slight prominence behind the eye on each side. The mandibles are long and gently curved, with a short sharp basal tooth beneath and a fairly long one above. The *pronotum* is short, opaque, with the margin rugosely punctured all round, except in the middle of the front margin. There is a very feeble longitudinal impression in the middle posteriorly, containing a double series of fine punctures, which become coarser and confluent near the hind margin. The sides are straight and parallel, with the front angles obliquely truncate or excised and the hind angles broadly rounded. The scutellum is punctured. The *elytra* have each six deep dorsal striæ with smooth flat intervals and two less deep lateral striæ, and the sides are densely punctured and a little flattened. The shoulders are acute-angled and the outer margins gently rounded. The *mentum* and *submentum* are finely granular and opaque, the *metasternum* is shining in the middle and slightly hollowed there, rugulose at the sides, and the *abdomen* is finely and unevenly punctured.

Variation of the male. In the smallest specimens the lower tooth of the mandible is wanting. In those of medium size the upper tooth is close to the base and directed a little backward. In larger specimens it recedes from the base and assumes a more forward direction. In the large type specimen this tooth arises just in front of the middle and points obliquely forward. In the large example the head, pronotum and elytra are relatively broader than in smaller ones and the surface of the pronotum and elytra is duller. The mentum of the large specimen bears a very few punctures. These become more numerous in smaller ones.

♂. *Length* (with mandibles), 37–44 mm.; (without mandibles) 25–31 mm.: *breadth*, 12·5–15·5 mm.

♀. *Length*, 26 mm.; *breadth*, 11 mm.

ASSAM: Manipur (*W. Doherty*). BURMA: Ruby Mines (*W. Doherty*); Loi Kyaw, Tawng Peng, Shan States, 6000 ft. (*J. Coggin Brown*, Feb., March). ? BENGAL: Darjeeling.

Type in the Oberthür collection.

The type specimen (labelled as from Darjeeling) is considerably larger than the male specimens taken by Doherty, and the mandibular tooth, as in similar large specimens of *A. parallelus*, is quite differently placed. The elytra are less glossy. The species is distinguished from *A. parallelus* by the absence of frontal teeth on the head of the male and the deep excision of its anterior margin. The marginal grooves at the front of the pronotum are also shorter. The female is easily distinguished from that of *A. parallelus* by the coarsely punctured median depression of the pronotum, the more equal and much less punctured dorsal intervals of the elytra and the differently shaped mandibles.

98. **Ægus eschscholtzi.** (Plate XXIII, fig. 1.)

Lucanus eschscholtzii Hope & Westw.,* Cat. Luc. Col. 1845, p. 22.
Ægus eschscholtzi Boil., Trans. Ent. Soc. Lond. 1913, p. 258.

Black, with the elytra, and in small specimens the pronotum also, shining, the body depressed, the legs short and rather stout.

♂. The *head* is dull and sooty, broad and flat, not hollowed in front, with the front margin very gently excised, minutely toothed on each side, the eyes very small, the sides of the head nearly straight in front, feebly and bluntly prominent behind the eye. The *pronotum* is flat, the sides straight and parallel almost to the base, where they are strongly rounded. The *scutellum* bears a few punctures. The *elytra* are short but a little produced at the apex and bear six deep dorsal striæ. The base, sides and apices are strongly and densely punctured, the outer edges gently curved and narrowly flattened. The *mentum* and *submentum* are entirely opaque. The sides of the *metasternum* are strongly punctured and the *abdomen* is scantily punctured, with the exception of the last sternite, which is closely punctured.

♀. Unknown.

Variation of the male. Small specimens are rather narrow, with the upper surface shining, except the head, the pronotum well punctured, very closely at the sides, the front angles bluntly produced, the dorsal intervals of the elytra convex and finely but distinctly punctured. The mandibles are evenly curved, broad at the base, where they are a little produced internally, and bear a second tooth above and a little in advance of the basal one. A large specimen (the type) is very broad and flat, with the head and pronotum entirely opaque, punctured only at the sides, the dorsal intervals of the elytra flat and, except the sutural one, almost unpunctured. The upper tooth of the mandible is placed in the middle of its length and is directed forward.

♂. *Length* (with mandibles), 16–24 mm.; (without mandibles) 13–19 mm.: *breadth*, 5·5–8 mm.

Tenasserim. Malay Peninsula.

Type in the Hope Dept., Oxford University Museum.

M. Boileau suggested Java as the real habitat of this species, but the abbreviation so interpreted by him is Hope's contraction of the word Tenasserim.

99. **Ægus linealis.** (Plate XXIII, fig. 2.)

Ægus linealis Did., Col. Luc. du Globe, 1928, p. 54.

Black, not very shining, convex, without hair or setæ, except upon the legs, which are fairly slender. The eyes rather large. The pronotum with an oval impression in the middle, deep in front and extending from front to hind margin, and the elytra broadly rounded behind, narrowly flattened at the sides and very deeply grooved, except at the sides, which are strongly and closely punctured.

♀. Elongate-ovate and very convex. The *head* is strongly and very closely punctured, the sides nearly straight, obtusely angular in front, diverging and ending abruptly behind the eyes. The mandibles have each a large triangular sharp tooth at the inner edge. The *pronotum* is everywhere coarsely and very closely punctured. The lateral margins are irregularly serrate, very feebly curved in front, strongly rounded beyond the middle, the base straight and hind angles absent. The *scutellum* bears a few punctures. The dorsal grooves of the *elytra* are very deep, the intervals rather closely and irregularly and the sides and apices rugosely punctured. The lateral edges are gently curved and finely serrate. The *mentum*, the sides of the *metasternum* and the bases of the ventral *sternites* are coarsely punctured.

♂. Rather parallel-sided and sub-cylindrical. The *head* is flat, sparsely or moderately punctured, with the front margin very gently excised, the sides almost straight and parallel, ending rather abruptly behind, with a sharp triangular tooth behind the eye. The *pronotum* is finely and scantily, moderately, or very strongly and closely punctured, with the lateral edges irregularly and rather finely crenate, nearly straight and parallel to far beyond the middle, where they meet the base in a very blunt angle. The *scutellum* bears a few punctures. The *elytra* bear six very deep but not very regular dorsal striæ, the intervals are finely punctured and the sides, as well as the base and apices, are rugosely punctured. The shoulders are acutely angular and the lateral margins finely crenate in front. The *mentum* is opaque, the sides of the *metasternum* are rugose and the *abdomen* is scantily punctured.

Variation of the male. Small males resemble the female.

The head and pronotum are strongly punctured and not opaque; the sides of the latter are slightly convergent, the front angles rounded; the elytral intervals are narrow and distinctly punctured. The tooth behind the eye is feeble, the mandible short and triangular, but with the tip acutely produced. In larger specimens the median depression alone of the pronotum is strongly punctured, the sides, as well as the head, are more finely punctured and opaque, and the elytral intervals are scantily punctured. The mandibles are more slender and a little produced at the base internally. Large specimens have the elytral intervals very minutely punctured, the head and pronotum entirely opaque and lightly punctured. The front angles of the thorax are truncate. The mandibles are about twice as long as the head and in addition to the basal tooth there is a second tooth above and a little in front of it.

♂. *Length* (with mandibles), 14–22 mm.; (without mandibles) 12–17 mm.: *breadth*, 5·5–7·5 mm.

♀. *Length*, 14–15 mm.; *breadth*, 6 mm.

Darjeeling Distr.: Pedong (*L. Durel*); Mangpu (*E. T. Atkinson*). Assam: Naga Hills (*W. Doherty*).

Type in the Paris Museum.

Genus **CALCODES.**

Calcodes Westw., Ann. Sci. Nat. (2) i, 1834, pp. 116, 118; Arrow, Trans. R. Ent. Soc. lxxxiii, 1935, p. 107.
Lucanus subg. *Calcodes* Westw., Cat. Luc. Col. 1845, p. 5.
Chalcodes Gemm. & Har., Cat. Col. iii, 1868, p. 947.
Anoplocnemus Hope, Trans. Ent. Soc. Lond. iii, 1844, p. 279; Burm., Handb. Entom. v, 1847, p. 357. (Type, *burmeisteri* Hope.)
Lucanus subg. *Odontolabis* Westw., Cat. Luc. Col. 1845, p. 5. (Type, *delesserti* Guer.)
Odontolabis Leuthn., Trans. Zool. Soc. Lond. 1885, p. 385.
Neolucanus Thoms., Ann. Soc. Ent. France (4) ii, 1862, p. 415; Leuthn., Trans. Zool. Soc. Lond. 1885, p. 420. (Type, *baladeva* Hope.)

Type, *Lucanus æratus* Hope.

Range. The Indo-Malayan Region.

Canthus produced backward and united with the gena, completely dividing the eye into upper and lower halves, the lower half large and prominent. Antennæ with 3-jointed club. Mentum more or less semicircular, the front margin entire; ligula short, scarcely bilobed, with very long hair-fringe; labial palpi not long, the last joint oval. Maxilla with long densely hairy outer lobe, the inner lobe without chitinous hook in either sex, maxillary palpi moderately long. Prosternum much or little produced behind, sometimes sharply pointed and directed downward, sometimes very blunt. Middle and hind tibiæ entirely devoid of lateral spines.

♂. Head and mandibles longer than those of the female and often very strongly developed.

The legs are longer in the male than in the female, the front tibia broad in the latter and more or less slender in the male.

The prosternum may differ in the two sexes and sometimes forms a sharp downwardly directed process in the male. In some species (*C. castanopterus*, *parryi*, etc.) the mentum is bare in the female and covered with a dense hairy mat in the male.

The females of this genus are closely similar, but the males vary greatly. In large male specimens the head is often much larger than that of the female, the front margin strongly ridged, the anterior part of the head hollowed and the mandibles long and branched. In small specimens of all the species the mandibles are only a little longer than those of the female and simply serrate at the inner edge, and some species (e.g. *C. parryi* Leuthner, *castanopterus* Hope) do not advance far beyond this condition in their largest known development. Of some, however, few examples are yet known and it should always be borne in mind that more highly developed phases may occur than those which have been described. In some species the most highly developed form constitutes a distinct phase not connected by intermediates with the lower stages, and this phase may be rare.

The genus *Calcodes* is one of the most characteristic amongst the insect genera of tropical Eastern countries. The large size and bright colours of some of its species and the remarkable development attained by the mandibles of many of the males have naturally attracted special attention to them. All the forms are easily recognizable by the completely divided eyes, the absence of spines on the middle and hind tibiæ and the structure of the ligula and maxillæ. Thomson proposed a separate genus for certain of the species in which the males have no process behind the eye and the mandibles do not attain a very great development and this has been accepted by later authors. The two features, however, are not always associated; the postocular process occurs in all stages of development in some species and highly developed mandibles only occur in large individuals in any species. Generic characters confined to one sex are in any case highly inconvenient and it is only necessary to place side by side females of such species as *C. cuvera* and *parryi* (representing the two types) to be convinced of the impossibility of a generic separation.

Key to the Species of Calcodes (males).

1 (36) Surface not metallic.
2 (23) Upper surface not entirely dark.
3 (20) Elytra parti-coloured, yellow (or red) and black.

4	(5)	Elytra black, with red or yellow outer margins	*sinensis* Westw., p. 187.
5	(4)	Elytra yellow, with black sutural band or patch.	
6	(9)	Black sutural band not dilated at the base.	
7	(8)	Epipleuræ of the elytra black	*versicolor* Did., p. 188.
8	(7)	Epipleuræ of the elytra yellow	*elegans* Moll., p. 189.
9	(6)	Black sutural band dilated at the base.	
10	(17)	Hind angles of the pronotum very sharp.	
11	(12)	Black sutural triangle reaching apices of elytra	*cuvera* Hope, p. 190.
12	(11)	Black sutural triangle confined to anterior half of elytra.	
13	(16)	Elytra elongate, shining.	
14	(15)	Epipleuræ of the elytra black	*delesserti* Guer., p. 192.
15	(14)	Epipleuræ of the elytra yellow	*burmeisteri* Hope,p.193.
16	(13)	Elytra short and broad, not shining . . .	*mouhoti* Parry, p. 195.
17	(10)	Hind angles of the pronotum very blunt.	
18	(19)	Elytra very short ; sutural stripe very narrow behind	*parryi* Leuthn., p. 196.
19	(18)	Elytra not very short ; sutural stripe less narrow	*marginatus* Wat., p.196.
20	(3)	Elytra orange or rust-red (sometimes with very inconspicuous black edges).	[p. 197.
21	(22)	Elytra rather narrow, entirely shining.	*castanopterus* Hope.
22	(21)	Elytra broader, dull at the sides	*robustus* Boil., p. 199.
23	(2)	Upper surface entirely dark.	
24	(35)	Front tibia with distinct lateral teeth.	
25	(34)	Upper surface without hair.	
26	(29)	Head with lateral process behind the eye.	[p. 200.
27	(28)	Elytra glossy	*siva* Hope & Westw.,
28	(27)	Elytra dull	*platynotus* Hope &
29	(26)	Head without lateral process behind the eye.	[Westw., p. 201.
30	(33)	Elytra short, not shining.	
31	(32)	Elytra very short ; sides of the head rounded in front	*brevis* Boil., p. 203.
32	(31)	Elytra rather short ; sides of the head obtusely angular in front	*latus* Boil., p. 203.
33	(30)	Elytra shining, not very short	*baladeva* Hope, p. 204.
34	(25)	Upper surface with very fine hairy clothing	*dalmani* Hope, p. 206.
35	(24)	Front tibia without distinct lateral teeth	*carinatus* L., p. 207.
36	(1)	Surface metallic, coppery	*æratus* Hope, p. 209.

Key to the Species (females).

1	(36)	Surface not metallic.	
2	(23)	Upper surface not entirely dark.	
3	(20)	Elytra parti-coloured, yellow (or red) and black.	
4	(5)	Elytra black with red or yellow outer margins	*sinensis* Westw., p. 187.
5	(4)	Elytra yellow with black sutural band or patch.	

6	(17)	Lateral angle of the pronotum not very blunt.	
7	(14)	Black sutural area extending to the shoulders.	
8	(11)	Black sutural area triangular.	
9	(10)	Lateral angle of pronotum very sharp.	*cuvera* Hope, p. 190.
10	(9)	Lateral angle of pronotum not very sharp	*delesserti* Guer., p. 192.
11	(8)	Black sutural area not triangular.	[p. 193.
12	(13)	Elytra very shining	*burmeisteri* Hope,
13	(12)	Elytra not very shining.............	*versicolor* Did., p. 188.
14	(7)	Black sutural area not extending to the shoulders.	
15	(16)	Upper surface very dull	*mouhoti* Parry, p. 195.
16	(15)	Upper surface not very dull	*elegans* Möll., p. 189.
17	(6)	Lateral angle of the pronotum very blunt.	
18	(19)	Elytra very short ; sutural band very narrow behind	*parryi* Leuthn., p. 196.
19	(18)	Elytra not very short ; sutural band less narrow behind	*marginatus* Wat., p.196.
20	(3)	Elytra orange or rust-red (sometimes with very inconspicuous black edges).	[p. 197.
21	(22)	Elytra rather narrow, entirely shining.	*castanopterus* Hope,
22	(21)	Elytra broader, dull at the sides	*robustus* Boil., p. 199.
23	(2)	Upper surface entirely dark.	
24	(33)	Upper surface not very glossy ; lateral angle of pronotum not very acute.	
25	(28)	Elytra not very short.	
26	(27)	Lateral angle of the pronotum sharp. .	*baladeva* Hope, p. 204.
27	(26)	Lateral angle of the pronotum blunt. .	*latus* Boil., p. 203.
28	(25)	Elytra very short and broad.	
29	(30)	Hind angle of the pronotum very blunt	*brevis* Boil., p. 203.
30	(29)	Hind angle of the pronotum sharp.	
31	(32)	Head produced laterally	*platynotus* Hope, p. 201.
32	(31)	Head not produced laterally	*carinatus* L., p. 207.
33	(24)	Upper surface very glossy ; lateral angle of the pronotum very acute.	[p. 200.
34	(35)	Black ; elytra broad	*siva* Hope & Westw.,
			[Westw., p. 206.
35	(34)	Dark brown ; elytra narrow.........	*dalmani* Hope &
36	(1)	Surface partly metallic	*æratus* Hope, p. 209.

100. **Calcodes sinensis.** (Plate XVI. figs. 1–3.)

Lucanus gazella, var. *sinensis* Westw., Cab. of Oriental Ent. 1848, p. 54, pl. 26, figs. 2, 3, 4.

Odontolabis sinensis Leuthner, Trans. Zool. Soc. Lond. 1885, p. 450, pl. 91, figs. 1–4.

Black, not very shining, the outer margins of the elytra conspicuously bordered with orange or red. Rather depressed. The prothorax and elytra rather short, the latter dilated a little behind the shoulders, with flattened margins and narrowed to the extremity, opaque at the sides, feebly and minutely punctured and scarcely shining internally. The prosternum

produced behind the coxæ as a sharp-pointed cone, directed vertically downwards in the male and backwards in the female.

♀. Oval in shape. The *head* is short and broad, opaque and unevenly punctured, the canthus strongly and bluntly produced outward on each side. The *pronotum* is lightly punctured, densely granular and very opaque at the sides, the front angle is broadly rounded, the lateral margin gently curved to the lateral angle, which is acute but not spiniform, and strongly sinuate to the acute hind angle. The *abdomen* is shining and rather sparingly punctured.

♂. The *head* is finely and densely granular, its sides oblique in front of the eyes and forming an acute but not long process behind them. The *pronotum* also is finely and densely granular, entirely opaque and sooty at the sides. The front angles are a little produced and the lateral angle forms a sharp spine. The *abdomen* is dull and not distinctly punctured. The front *tibia* is slender and armed with three or four sharp lateral spines.

Variation of the male.—Inconstant phase. In small males the head is strongly excised in front, the mandibles are very irregularly serrate at the inner edge and the right one is much broader than the left. In specimens of medium size the mandibles remain dissimilar, but two or three strong teeth only remain before the terminal part. In large specimens the mandibles, although more slender, are asymmetrical, the large teeth being alternate.

Constant phase. The mandibles are about twice the length of the head, slender and symmetrical. They are gently dilated at the base, and the dilated part is produced into a short, sharp, oblique tooth. Beyond the middle there is a strong bifurcated branch and the tip is forked. The front edge of the head is strongly carinate and almost straight.

♂. *Length* (with mandibles), 44–79 mm. ; (without mandibles) 39–54 mm. : *breadth*, 19–26 mm.

♀. *Length*, 32–45 mm. ; *breadth*, 15–26 mm.

Burma : Loimwe, S. Shan States, 5600 ft. (*J. P. Drummond*, Oct.). China : Hongkong ; Canton.

Type in the Hope Department, Oxford University Museum.

101. **Calcodes versicolor.** (Plate XX, figs. 4, 5.)

Neolucanus versicolor Did.,* Col. Luc. du Globe, 1931, p. 228.

Black, with the elytra bright yellow, their outer edges very narrowly and the basal and external edges less narrowly black. Not very convex ; the upper surface not shining, except near the elytral suture, the outer margins of the elytra not distinctly flattened but well rounded.

♀. The elytra are decorated with a moderately broad black sutural stripe, a little dilated at the base and slightly narrowed

at the extremity. Oval in shape and not very broad. The *head* is finely granular and opaque, except in front, where it is coarsely rugose. The *pronotum* is finely and unevenly punctured in the middle and densely granular and opaque at the sides. The lateral edges are gently rounded, the lateral angle is moderately sharp and the hind angle very acute. The base is almost straight. The *elytra* are very finely and lightly punctured, except at the sides, which are opaque. The *prosternal process* is horizontal and not distinctly produced. The lateral teeth of the front *tibia* are rather feeble.

♂. The black sutural stripe of the elytra is rather narrow, almost parallel-sided, but extends along the front margin and is slightly narrowed at the extremity. The *head* is elongate, flat, densely granular and opaque, with the sides angularly dilated well behind the eyes. The *pronotum* also is densely granular and opaque. The lateral angle is acutely produced, the margins deeply concave behind and the hind angles very acute. The *elytra* are dull, except in the anterior dorsal region, which is slightly shining and feebly punctured. The *prosternal process* is produced slightly downwards. The front *tibia* is slender and has a single sharp lateral spine in addition to the terminal fork.

♂. *Length* (with mandibles), 38 mm.; (without mandibles) 32 mm.: *breadth*, 15 mm.

♀. *Length*, 29–33 mm.; *breadth*, 14–15 mm.

S. India: Mundakayam, Travancore (*T. V. Isaac*, April); Tinnevelly, Madras (*A. Hamid Khan*, March); N. Kanara (*H. E. Andrewes*).

Type in the British Museum.

This species has hitherto been known from a female specimen alone. I have seen only a single male of small size, in which the mandibles are shorter than the head. The latter resembles that of small specimens of *C. carinatus*. Large males will no doubt be found to have slender mandibles.

102. **Calcodes elegans.** (Plate XVIII, fig. 6.)

Odontolabis elegans Möll.,* Insektenbörse, xviii, 1901, p. 363; Deutsche Ent. Zeits. 1903, p. 347; Insektenbörse, xxiii, 1906, p. 31; Zang, Deutsche Ent. Zeits. 1905, p. 212.

Black, with the elytra bright yellow, except a narrow black sutural line, gradually dilated anteriorly in the female but not in the male. The epipleuræ of the elytra also yellow in both sexes, except at the edges. Rather short and broad, with the sides of the elytra conspicuously flattened anteriorly. The upper surface opaque but the elytra moderately shining.

♀. The black sutural border is very narrow in the posterior part of the elytra, but gradually dilates to the base, forming a

narrow triangle. The *head* is rugose in front, densely granular behind, with larger scattered granules, except upon the vertex. The *pronotum* is densely granular at the sides and moderately shining in the middle and there are fine, rather scattered, punctures over the whole surface. The *elytra* are rather opaque at the sides and behind and shining in the middle anteriorly, where they are distinctly punctured. The *prosternum* is horizontally produced and fairly sharp.

♂. The black sutural border is very narrow. The *head* is finely and densely granular and has an angular process on each side behind the eye. The *pronotum* is also finely and densely granular, but rather less densely in the middle. The front angles are rather sharply produced, the lateral angles are spinose and the hind angles are acute. The *elytra* are finely alutaceous, without distinct punctures. The *prosternum* is produced downward as a sharp conical process. The front *tibiæ* bear two or three sharp lateral spines.

Variation of the male. In small specimens the head is deeply emarginate in front but without sharp edge or ridge. The mandibles are shorter than the head, very broad at the base and irregularly toothed to near the tip. In large examples the head is very broad and its front edge forms a strongly elevated broad gently curved ridge. The mandible bears a sharp tooth directed obliquely forward at a little distance from the base and a bifid process with a similar direction a little before the end. The tip is strongly bifurcated with one or two minute teeth in the cleft.

♂. *Length* (with mandibles), 39–65 mm.; (without mandibles) 33–47 mm.: *breadth*, 15–22 mm.

♀. *Length*, 32 mm.; *breadth*, 16 mm.

Burma: Karen Hills, Cheba, 2700–3300 ft.; Asciui, 3600–4000 ft. (*L. Fea*, Dec.); Tenasserim, Sukli, 1800 ft. (*R. Malaise*, Oct.).

Type in the Genoa Museum; co-type in the British Museum.

One large and one small male specimen, kindly lent to me by the Genoa Museum, evidently represent the constant and inconstant phases respectively. Zang pronounced this species identical with the Siamese *C. mouhoti* Parry, but the elytra, in addition to the absence of any dilatation of the sutural stripe in the male, are more shining in both sexes than in that insect.

103. **Calcodes cuvera.** (Plate XVII, fig. 5; Plate XVIII, figs. 4, 5.)

Odontolabis cuvera Hope,* Trans. Linn. Soc. xix, 1845, p. 105, pl. 10, fig. 3.

Odontolabis cuvera Leuthner, Trans. Zool. Soc. 1885, p. 452, pl. 91, figs. 7–10.

Lucanus bicolor Saund., Trans. Ent. Soc. Lond. ii, 1837, p. 177, pl. 16, fig. 3.
Lucanus prinsepii Hope & Westw., Cat. Luc. Col. 1845, p. 16; Westw., Cab. Orient. Ent., 1848, p. 54, pl. 26, fig. 5.
Odontolabis saundersi Hope, Trans. Linn. Soc. xix, 1845, p. 105.
Anoplocnemus bicolor Burm., Handb. Ent. v, 1847, p. 360 (part).
Var. *alticola* Moll.,* Insektenbörse, xix, 1902, p. 353.
Odontolabis gestroi Boil.,* Le Naturaliste, xxiv, 1902, p. 204.

Black, with the elytra pale yellow, except a common black sutural band of triangular shape, not quite reaching the shoulders at the base and gradually tapering to a point at the end of the suture. The epipleuræ of the elytra also yellow in the male. The prosternal process produced to a rather sharp point.

♀. The black sutural patch tapers evenly and has an almost straight outer edge. The *head* is rugosely punctured in front and at the sides and finely coriaceous behind. The *pronotum* is shining and finely and sparsely punctured, except at the sides, which are finely granular and opaque. The front angles are very blunt, the lateral angulation is fairly sharp and the hind angles are acute. The *elytra* are rather opaque, except upon the median black area, which is shining, with a fairly close puncturation. The *prosternum* is usually produced a little downwards.

♂. The black sutural patch has a concave outer edge and is narrower behind than in the female. The head is closely granular but not entirely opaque, the *pronotum* is densely granular and opaque at the sides, finely coriaceous and moderately shining in the middle and the elytra are rather shining. The *head* bears a sharp process behind each eye, the front angles of the *pronotum* are produced but not very acute, the lateral angulation is produced into a sharp spine and the hind angle is also spiniform. The *prosternal* process is produced obliquely downward. The front *tibia* is slender and armed with three or four sharp lateral spines.

Variation of the male.—Inconstant phase. Small examples have the mandibles shorter than the head, broad, evenly rounded externally and unevenly toothed from the base to the tip. The front of the head is sloping, without a sharp ridge. In larger specimens the front of the head forms a curvilinear ridge and the mandible, in addition to several small irregular apical teeth, has two strong teeth which alternate with those of the opposite mandible.

Constant phase. The front of the head forms a strongly elevated straight carina. The long mandible bears a small sharp oblique tooth a little beyond the base and a strong truncate process beyond the middle and the extremity is broadly forked, with two or three minute teeth in the fork.

♂. *Length* (with mandibles), 43–71 mm. ; (without mandibles) 40–55 mm. : *breadth*, 19–25 mm.

♀. *Length*, 36–42 mm. ; *breadth*, 18–19 mm.

Darjeeling Distr. : Kurseong ; Gopaldhara, Rungbong Valley (*H. Stevens*). Assam : Cherrapunji, Khasi Hills (*Col. Buckley*) ; Manipur (*W. Doherty*). Burma : Bhamo (*T. Selkirk*) ; Nam Tami Valley (*R. J. H. Kaulbach*, Sept.) ; Kachin Cauri (*L. Fea*).

Type in the Hope Department, Oxford University Museum.

In the var. *alticola* the black sutural stripe in the male is wider than in the typical form, resembling that of the female, but the latter also shows some increase of the black pigment.

Type in the Oberthür collection.

104. **Calcodes delesserti.** (Plate XVII, figs. 1, 4.)

Lucanus bicolor var. *delesserti* Guér., Delessert's Souvenir d'un Voyage dans l'Inde, ii, 1839, p. 40, pl. 12, fig. 3.

Odontolabis delesserti Leuthner, Trans. Zool. Soc. Lond. 1885, p. 454, pl. 92, figs. 1–4.

Black, with the elytra pale yellow, except a common black sutural stripe, narrow upon the posterior half, dilating gradually upon the anterior half and forming a triangle, the base of which extends from shoulder to shoulder.

♀. The common sutural black patch forms a triangle occupying the entire basal margin and tapering evenly to the apex, its sides concave. The upper surface is shining, with the exception of the *head*, which is very coarsely and in front very densely punctured, and the sides of the *pronotum*, which are very finely granular, the remainder of its surface being finely and sparsely punctured. The front angles of the pronotum are very blunt, the lateral angulation is rather sharp and the hind angles are also sharp. The *elytra* are rather closely punctured but more shining than those of the male. The *prosternum* is usually blunt behind.

♂. The common black sutural patch forms a triangle upon the anterior half of the elytra and is continued as a narrow sutural border to the apex. The head and pronotum are densely granular and opaque, but rather less so at the middle of the latter, and the elytra are not very shining. The *head* bears a fairly strong process behind each eye. The front angles of the *pronotum* are produced but not very sharp, the lateral angulation forms a sharp spine and the hind angles are acutely produced. The *prosternal process* is produced obliquely downward. The front *tibia* is slender and has only one or two minute spines at the outer edge.

Variation of the male.—Inconstant phase. Small specimens have the mandibles not longer than the head, straight, except their curved tips, and unevenly toothed from the base almost

to the tip. The head is vertically emarginate in front, with a rather sharp but not raised upper edge. Rather larger specimens have longer, gently curved mandibles, with three well-marked detached teeth, a small basal one, a fairly long one not far from the last and a third not far from the middle. Neither these teeth nor the smaller ones at the end are symmetrically placed.

Constant phase. The head is very broad and its front edge strongly elevated. The mandibles are slender, strongly curved and symmetrically toothed. The basal tooth is very small, the next flat and obliquely truncate, the third is placed well beyond the middle and is bilobed. Another rather sharp tooth is developed not far from the tip, followed by one or two minute ones.

♂. *Length* (with mandibles), 42–83 mm. ; (without mandibles) 37–58 mm. : *breadth*, 17–26 mm.

♀. *Length*, 36–44 mm. ; *breadth*, 17–22 mm.

S. India : Shembaganur, Madura, 6000 ft. (*Father Manuel*) ; Nilgiri Hills (*H. L. Andrewes*).

Type unknown.

The Southern *C. delesserti* has so close a resemblance to the Northern *C. cuvera* that at first sight they appear alike but careful examination reveals numerous slight differences. The outline is not quite the same, the elytra being rather longer and narrower in the present species. The pattern is also a little different. The black sutural patch has rather more curvilinear sides, owing to its being broader at the base and more tapered behind. In the male the elytral epipleuræ are not pale, as in *C. cuvera*, the head is more granular and opaque and, in well-developed specimens, the basal tooth of the mandible is situated farther back and followed by an additional and broader process. The constant phase of the male appears to predominate over the inconstant phase in this species. Examples of the latter seem to be fewer in number and those of the constant phase vary to some extent in size, although not in the form of the mandible.

105. **Calcodes burmeisteri.** (Plate I, figs. 1–4 ; Plate XVI, fig. 6 ; Plate XVII, figs. 2, 3.)

Lucanus burmeisteri Hope,* Trans. Ent. Soc. Lond. ii, 1839, p. 279, pl. 13, fig. 3.
Anoplocnemis bicolor Burm., Handb. Ent. v, 1847, p. 360 (part).
Odontolabis burmeisteri Leuthn., Trans. Zool. Soc. 1885, p. 455, pl. 92, figs. 5–9.

Black, with the elytra bright yellow, except a black sutural stripe dilated at the base but not extending from shoulder to shoulder. The elytral epipleuræ also pale yellow. Rather narrow and convex, with the middle of the pronotum and the whole of the elytra smooth and shining.

♀. The black sutural stripe is broad, dilating a little at the base and abruptly narrowing to a point at the extremity. The *head* is opaque, rugosely punctured in front and rather finely behind, with the canthus rather sharply produced outwards. The *pronotum* is smooth and finely punctured in the middle and densely granular at the sides. The front angles are very blunt and the lateral and hind angles not very sharp. The *elytra* are very smooth and shining. The *prosternum* forms a fairly sharp horizontal process. The front *tibia* is broad and armed with three or four lateral teeth.

♂. The black sutural stripe is very narrow posteriorly, but forms a small, rather irregular triangle in the basal part. The *head* is densely granular and has an angular projection behind the eye on each side. The *pronotum* is feebly coriaceous and shining in the middle, densely granular at the sides and coarsely rugose near the outer margins. The front angles are not very sharp, the lateral and posterior angles acute but not spiniform. The *elytra* are very smooth and shining and rather long and narrow. The front *tibia* is very slender and armed only with one or two minute lateral spines. The *prosternum* forms a sharp downward-directed conical process.

Variation of the male.—Inconstant phase. In small males the postocular process is feeble, the head is strongly emarginate in front and the short mandibles are in close contact and very irregularly serrate internally. In the largest representatives of this phase that I have seen, the head is long, the postocular processes are acute and the mandibles are moderately long and very asymmetrical, the right having two strong internal teeth and the left one only placed at a point between those of the opposite mandible.

Constant phase. The head is very large and its front margin forms a strongly elevated straight ridge. The mandibles are extremely long, slender and symmetrical. Each has a small sharp tooth near the base, a very strong downward-directed tooth placed near the middle and another intermediate in size and position. The tip is forked and there are two very small teeth between the branches of the fork.

♂. *Length* (with mandibles), 50–95 mm; (without mandibles) 44–69 mm.: *breadth*, 20–29 mm.

♀. *Length*, 42–51 mm.; *breadth*, 20–23 mm.

S. India: Travancore (*R. S. Imray*); Nilgiri Hills (*H. L. Andrewes*); Anaimalai Hills.

Type in the Hope Department, Oxford University Museum.

This species rather closely resembles *C. delesserti*, but the elytra are longer and the black sutural stripe is narrower at the base, not extending to the shoulders, not triangular in shape in the female and forming only a very small triangle in front in the male. The elytral epipleuræ, dark in

C. delesserti, are here pale and the body is more elongate than that of the other species. In the constant phase the head and mandibles are much more strongly developed.

106. **Calcodes mouhoti.** (Plate XVI, figs. 4, 5.)

Odontolabis mouhoti Parry, Trans. Ent. Soc. Lond. 1864, p. 14, pl. 1, fig. 1; Leuthner, Trans. Zool. Soc. 1885, p. 453, pl. 91, fig. 5; Zang, Deuts. Ent. Zeits. 1905, p. 213.

Black, with the elytra bright yellow, except for a narrow black sutural stripe, triangularly dilated at the base but not reaching the shoulders, the extreme outer edges black but the epipleuræ partly yellow. The elytra short and rather broadly dilated at the outer margins.

♀. The black sutural triangle is moderately broad at the base of the elytra, tapers evenly behind for two-thirds of their length and is continued to their extremities as a very narrow marginal stripe. The body is broadly oval. The *head* is strongly punctured in front, densely granular behind and the canthus is strongly produced outwards. The *pronotum* is opaque, with minute scattered punctures in the middle, and densely granular at the sides. The lateral angle is sharp, but not acutely produced. The *elytra* are rather shining, the outer margins broad and flattened. The *prosternum* is a little produced backwards.

♂. The black sutural margin is very narrow but a little dilated in the anterior third of the elytra, where its outline is rather irregular.

The body is rather broad and flat, with the elytra conspicuously dilated a little behind the shoulders. The head and pronotum are densely granular and opaque. The sides of the *head* are oblique and rather straight in front and produced into a sharp process behind the eye. The front angle of the *pronotum* is bluntly produced, the lateral angle acutely produced and the hind angle sharp. The *elytra* are rather flat and dull with scarcely distinct puncturation. The *prosternum* is produced downwards as a sharp conical process.

Variation of the male. A small specimen in the British Museum has the head flat and gently emarginate in front, the mandibles shorter than the head, with the whole inner edges bluntly toothed. The type specimen is larger and has the front margin of the head a little elevated, the mandibles rather longer than the head, with strong asymmetrical and alternating teeth.

♂. *Length* (with mandibles), 45–64 mm.; (without mandibles) 40–51 mm.: *breadth*, 19–24 mm.

♀. *Length*, 41 mm.; *breadth*, 21 mm.

Burma: Kawkareik, Dawna Hills (*Archbold*, Dec.). South-East Siam. Cambodia.

Type in M. René Oberthür's collection.

107. **Calcodes parryi.** (Plate XX, figs. 6, 7.)

Neolucanus parryi Leuthner,* Trans. Zool. Soc. Lond. 1885, p. 424, pl. 85, fig. 4.
N. leuthneri Boil., Bull. Soc. Ent. France, 1899, p. 175.

Black, not shining, with the elytra bright yellow, except for a narrow black outer margin and a common triangular patch extending from shoulder to shoulder and narrowing gradually and evenly to the extremity.

Oval in shape, not very convex, with very short elytra. The head and pronotum dull, as well as the elytra, except that the latter are feebly shining upon the black sutural area. The front angles of the pronotum pointed, the sides gently curved to the blunt lateral angles and concave to the fairly sharp basal angles. The shoulders of the elytra blunt and the outer margins rounded and narrowly reflexed. The prosternal process bluntly pointed.

♀. The *head* is short and broad, rugosely punctured in front. The mandibles are short, sharp and very broad. The *mentum* is closely pitted and naked.

♂. A little longer and narrower than the female. The *head* is longer, scarcely dilated in front and slightly swollen on each side behind the eye. The mandibles are short and simple, narrow and rather straight, with the inner edge sharply serrate. The *mentum* is densely clothed with yellow hair. The *legs* differ little from those of the female, but the middle tibia has a tufted lobe at the extremity of its inner edge and the tarsi are more slender.

♂. *Length* (with mandibles), 23–36 mm.; (without mandibles) 21–32 mm.: *breadth*, 10–16 mm.

♀. *Length*, 29–35 mm.; *breadth*, 14–17 mm.

Burma: Cheba, Karen Hills, 2700 to 3300 ft. (*L. Fea*, Dec., Jan.). Siam. Tonkin.

Type in M. René Oberthür's collection; co-type in the British Museum.

This species is a little smaller than *C. marginatus* Wat., the elytra are rather shorter and the black sutural area is more narrowed behind, its outer edge forming a rather strong and regular curve.

108. **Calcodes marginatus.** (Plate XX, fig. 12.)

Neolucanus marginatus Wat.,* Ent. Month. Mag. ix, 1873, p. 53; Leuthner, Trans. Zool. Soc. 1885, p. 426, pl. 85, fig. 1 (not fig. 3); Boil., Trans. Ent. Soc. Lond. 1913, p. 247.
Neolucanus dohertyi Houlb.,* Insecta, iv, 1914, p. 281.

Black, not very shining, with the elytra bright yellow, except a narrow black outer margin and a common triangular sutural patch extending from shoulder to shoulder at the base and narrowing gradually, but not quite evenly, to the extremity.

Elongate-oval and not very convex. The head and pronotum opaque, the elytra dull at the sides and slightly shining upon the black sutural triangle. The front angles of the thorax pointed, the sides gently curved to the blunt lateral angles and then concave to the rather sharp basal angles. The outer margins of the elytra distinctly flattened and well rounded and the shoulders blunt. The prosternum very blunt behind the front coxæ.

♀. The *head* is short and broad, coarsely and rugosely punctured in front. The mandible is strongly rounded externally and bluntly toothed on the inner edge. The *mentum* is rugosely punctured and bare. The terminal fork of the front *tibia* is long and the tarsi are shorter than the tibiæ.

♂. The body is a little narrower than that of the female. The *head* is a little longer, not broad in front and slightly swollen behind the eyes. The mandible is a little longer and narrower, less curved externally and finely and sharply toothed at the inner edge. The *mentum* is densely clothed with yellow hair. The *legs* are little longer than those of the female, but the front tibia is a little narrower and the middle tibia bears a tufted lobe at its extremity internally. All the tarsi are a little longer than the tibiæ.

♂. *Length* (with mandibles), 35–37 mm.; (without mandibles) 29–33 mm.: *breadth*, 14·5–16·5 mm.

♀. *Length*, 34–41 mm.; *breadth*, 17–19·5 mm.

ASSAM: Naga Hills (*W. Doherty*); Manipur (*W. Doherty*). BURMA: Ruby Mines (*W. Doherty*); Sima (*R. J. Leonard*, Aug.); Kambaiti, 7000 ft. (*R. Malaise*, June).

Type in the British Museum; that of *dohertyi* in M. Oberthür's collection.

The type is a female, with which Waterhouse erroneously associated a male of *C. baladeva* Hope. The actual male differs very little from the female except in having a narrower head, the mandibles showing the minimum of dimorphism in this species. The legs differ little in length in the two sexes, but the terminal tuft upon the middle tibia of the male is a peculiar feature.

109. Calcodes castanopterus. (Plate XXI, figs. 5, 6.)

Lucanus castanopterus Hope,* Gray's Zool. Misc. 1831, p. 22.
Neolucanus castanopterus Leuthner, Trans. Zool. Soc. Lond. 1885, p. 423, pl. 84, figs. 13, 14.
Neolucanus flavipennis Boil.,* Bull. Soc. Ent. France, 1914, p. 107.
Neolucanus castanopterus var. *melas* Did., Col. Luc. du Globe, 1930, p. 146.
Neolucanus parvus Nagel, Deutsche Ent. Zeitschr. 1941, p. 54, fig. 1.

Black, with the elytra bright rust-red, except a narrow black basal margin, the extreme outer edges and the epipleuræ.

Oval and not very convex. The head and pronotum opaque, the latter less so in the dorsal part, and the elytra extremely glossy. The pronotum bearing only minute and indistinct punctures, its front angles bluntly produced, the lateral margins gently rounded to beyond the middle, where there is an extremely blunt angulation, and feebly concave to the hind angle, which is distinct but obtuse. The elytra scarcely visibly punctured, the shoulders blunt and the sides with distinct flattened and reflexed margins. The legs rather short and stout, and the mandibles very short in both sexes.

♀. Rather more broadly oval than the male. The *head* is coarsely rugose, except behind the eyes, the canthus rounded and a little prominent laterally. The mandibles are a little shorter, broader and more rounded externally than those of the male. The *pronotum* is opaque, its front angles are blunt, the sides well rounded to the lateral angle, which is very obtuse. The *mentum* is coarsely-pitted and bare. The front *tibia* is short and broad.

♂. Elongate-oval. The *head* is smooth and opaque, its sides nearly parallel in front of the eyes and rounded behind them. The anterior part is hollowed behind the mandibles. The mandibles are narrower, but scarcely longer than those of the female, less rounded externally and serrate at the inner edge. The lateral angle of the *pronotum* is a little sharper than in the female and the elytra are a little longer. The *mentum* is densely clothed with erect yellow hair. The *tarsi* are nearly as long as the tibiæ and have conspicuous pads of yellow hair beneath.

♂. *Length* (with mandibles), 28–30 mm.; (without mandibles) 26–27 mm.: *breadth*, 11–12·5 mm.

♀. *Length*, 24–26 mm.; *breadth*, 10·5–11·5 mm.

Nepal (*Maj.-Gen. Hardwicke*). Sikkim: Gantok 4000 to 5000 ft. (*R. W. G. Hingston*, July). Bengal: Kurseong (*R. P. Lebas*). Assam: Cherrapungi, Shillong (*H. M. Parish*, Aug.); Manipur (*W. Doherty*). Burma: Ruby Mines (*W. Doherty*).

Type in the British Museum; those of *flavipennis* Boil. and *melas* Did. in Dr. Didier's collection; that of *parvus* Nagel destroyed, co-types in the Oberthür collection.

In this species the two sexes differ little and there is no important variation in the males.

In certain Burmese specimens the antennæ have a 4-jointed club, the 7th joint being spongy and of similar form to the last three. M. Boileau, who possesses one such specimen, kindly submitted to me by Dr. Didier, regarded it as the representative of a distinct species, which he called *Neolucanus flavipennis*. Two specimens taken by Doherty at the Ruby Mines have also a distinctly 4-jointed club, but a third taken at the same time

shows a transition to the normal form. Other slight differences mentioned by Boileau appear to me to be individual only. The specimens with darker elytra, to which Dr. Didier has given the varietal name *melas*, were found by Doherty at Manipur. The colour may perhaps be due to a post-mortem change, but the species has a marked tendency to develope local races.

I have treated *parvus* Nagel as synonymous with *castanopterus*, as I can find in the description no reason for its separation, save the existence in the two type-specimens of certain oval depressions upon the head and thorax and of dark outer margins to the elytra. I have found similar depressions in particular specimens of this and other species, but they are always peculiar to individuals and not specific. It is improbable that they exist in all the remaining examples said to be in the Oberthür collection and no doubt unseen by Nagel. The extreme outer margins of the elytra of *C. castanopterus* are always dark and are a little widened in certain examples. Herr Nagel remarks that his specimens most resemble *C. vicinus* Pouill., but adds that Dr. Didier considered them to represent a local form of *castanopterus*. As typical examples of the species are found at Shillong it can scarcely be called a local race. It is described as having, like *castanopterus*, chestnut-red and very glossy elytra. Those of *C. vicinus* are yellow and not glossy.

110. Calcodes robustus. (Plate XXI, fig. 4.)

Neolucanus robustus Boil., Bull. Soc. Ent. France, 1914, p. 33. fig.

Black, not very shining, with the elytra bright orange-red, except the extreme margins, which are very narrowly black.

Oval and not very convex. The head and the front and sides of the pronotum densely coriaceous and opaque. The pronotum feebly punctured upon the dorsal part, its lateral edge gently curved to beyond the middle, where it is bluntly angulate, and feebly concave to the hind angle, which is rather sharp. The elytra minutely and unevenly punctured, with the lateral part dull and the outer margins flattened and well rounded. The prosternum rather sharply pointed behind. The mandibles short in both sexes and the legs not long.

♀. Rather broadly oval. The *head* is short and broad, the canthus bluntly produced outward. The mandibles are very broad, strongly curved externally. The lateral angulation of the *pronotum* is very blunt. The *mentum* is closely punctured and bare. The *abdomen* is shining and strongly punctured at the sides and apex. The *legs* are short and the front tibia very broad.

♂. The body is longer and more parallel-sided than that of the female. The *head* is longer and rather narrow, the canthus not produced laterally, the sides gently rounded behind the eyes. The mandibles, at their maximum development, are scarcely longer than the head, narrow, straight externally to near the tip and serrate at the inner edge. The lateral angle of the *pronotum* is less blunt than in the female but not sharp. The mentum is closely clothed with erect yellow hair. The *abdomen* is finely punctured and not shining. The front *tibia* is narrow but little longer than that of the female.

Variation of the male. In small specimens the mandibles are shorter than the head, very feebly curved externally and of quite simple form. In large specimens they are straight, less flat, and bear a strong erect tooth at the outer edge just before the tip.

♂. *Length* (with mandibles), 34–51 mm.; (without mandibles) 31–43 mm.: *breadth*, 15–21 mm.

♀. *Length*, 33–44 mm.; *breadth*, 17–20 mm.

Burma: Loimwe, South Shan States, 5600 ft. (*J. P. Drummond*, Oct.). Tonkin.

Type in Dr. Didier's collection.

111. **Calcodes siva.** (Plate XIX, figs. 1, 2, 4, 5.)

Lucanus siva Hope & Weston *, Cat. Luc. Col. 1845, p. 16.
Odontolabis siva Leuthner, Trans. Zool. Soc. Lond. 1885, p. 436, pl. 86, figs. 1–7.
Calcodes siva Arrow, Trans. R. Ent. Soc. Lond., 86, 1937, p. 241, pl. 1, fig. 2.

Black and shining, with the head and the sides of the pronotum opaque, the elytra very glossy, with very narrow opaque and flattened margins. The body not very broad, and the prothorax with very strongly and sharply produced lateral angles. The prosternum rather feebly pointed behind.

♀. The *head* is rugosely punctured and opaque, with bluntly triangular lateral lobes. The *pronotum* is very smooth and shining, with very minute sparse punctures, the sides densely granular and opaque. The *scutellum* is finely punctured. The *mentum* is coarsely rugose.

♂. The *head* is finely and densely granular and opaque, with the front part a little hollowed and its upper margin gently excised, the side rounded in front of the eye and produced into a strong spiniform process behind it. The *pronotum* is finely granular, the granulation becoming less dense towards the middle, which is moderately shining. The front angles are very blunt, the sides very obtusely angulate or abruptly rounded at a short distance from the front angles, gently

concave to the very acute lateral angles and strongly concave to the sharp hind angles. The *scutellum* is finely coriaceous. The *elytra* are very glossy, except at the extreme outer margins, with fine punctures in the inner anterior part. The *mentum* is densely granular and opaque.

Variation of the male. Inconstant phase. In small specimens the mandibles are not longer than the head, straight at the inner edge and finely and evenly serrate from base to apex. In larger ones a basal group of teeth is separated by a gap from the rest. With increasing size the mandibles become longer, the gap lengthens, the basal teeth become consolidated, and the first and last of the terminal group are larger than the rest. In specimens of full size the mandibles are about as long as the head and the latter is very broad.

Constant phase. In this phase the mandibles are always considerably longer than the head, which is not very broad, and are comparatively slender. They are curved, as in the inconstant phase, have a broad basal tooth with two or three rounded cusps and are forked at the end, with one or two minute teeth in the fork. The largest example of this phase I have seen is slightly smaller than the largest of the inconstant phase. The mandibles are rather more than double the length of the head and the teeth between the prongs of the terminal fork are reduced to slight vestiges. Males of both phases are found together, but examples of the inconstant phase are more numerous. I have seen no intermediates amongst the large number I have examined. Of about 60 males, 12 are of the constant phase.

♂. *Length* (with mandibles), 51–81 mm.; (without mandibles) 45–61 mm.: *breadth*, 21–25 mm.

♀. *Length*, 42–53 mm.; *breadth*, 18–25 mm.

Darjeeling Distr.: Rungeer Valley, 700–800 ft. (*F. H. Gravely*, May); Pedong (*L. Durel*); Mangpu (*E. T. Atkinson*); Gopaldhara, Rungbong Valley (*H. Stevens*). Bengal: Maini Mukh, Chittagong Hill Tracts (*R. P. Mullins*). Assam: Shillong; Khasi Hills; Patkai Hills (*W. Doherty*). Tonkin.

Type in the Hope Department, Oxford University Museum.

This is no doubt the species (wrongly identified as *C. carinatus*) recorded by D. Sharp (Proc. Ent. Soc. Lond., 1884, p. 18) as pupating in the thatch of a house in Assam.

112. **Calcodes platynotus.** (Plate XXI, figs. 1, 2.)

Lucanus platynotus Hope & Westw.,* Cat. Col. Luc. 1845, p. 18.
Odontolabis emarginatus Saund.,* Trans. Ent. Soc. Lond. 1854, p. 49, pl. 3, fig. 4.
Odontolabis platynotus Leuthner, Trans. Zool. Soc. Lond. 1885, p. 435, pl. 88, figs. 9–12; Boil., Trans. Ent. Soc. Lond. 1913, p. 239.

Black, the surface dull above and beneath, but the abdomen and legs shining, the soles of the tarsi and the inner face of the middle and hind tibiæ of the male densely clothed with short, bright yellow hairs. Rather short and broad, with the legs fairly long. The head, sides of the pronotum and elytra entirely opaque, the middle of the pronotum, the scutellum and the sutural margins of the elytra a little less so. The front angles of the pronotum blunt, the sides very gently curved to the lateral angles, which are strong but not acute and almost level with the base, then rather strongly concave to the hind angles, which are acute. The sides of the elytra rather strongly rounded and a little flattened. The prosternum strongly compressed behind, a little produced and pointed.

♀. The *head* is short, rugose in front, with the margin not excised, the canthus angularly-produced and the side without process behind the eye. There are fine punctures upon the middle part of the *pronotum* and the inner posterior part of the *elytra*. The *abdomen* is rather strongly punctured beneath. The lateral teeth of the front *tibia* are minute and the tip is rather feebly forked.

♂. The front of the *head* is excised, the canthus rounded or very slightly prominent laterally and there is a strong pointed process behind the eye on each side. The lateral angle of the *pronotum* is rather sharper than in the female. The lower surface is almost unpunctured. The *prosternal* process has an oblique direction. The front *tibia* is shortly but sharply forked at the end. All the tibial spurs are very short and that of the front tibia and the lower ones of the middle and hind tibiæ are hooked. The tarsi are long.

Variation of the male. The postocular processes of the head are sharp in small specimens and become broader and blunter with increasing size. The mandibles in small examples are very short, with their inner edges in close contact and irregularly toothed. In medium-sized examples they are rounded externally and a gap occurs between the two or three basal teeth and those succeeding, which remain in contact. With increase of size the gap becomes longer and the terminal teeth become fewer. In the largest specimens the mandibles are slender and capable of contact only at the base and extremity, the latter usually composed of four minute teeth.

♂. *Length* (with mandibles) 26–42 mm.; (without mandibles 24–31 mm. : *breadth*, 12–15 mm.

♀. *Length*, 24 mm.; *breadth*, 12 mm.

Burma : Cheba, Karen Hills, 2700–3300 ft. (*L. Fea*, Dec.). Tonkin. China : Shanghai; Hongkong.

Type in the Hope Department, Oxford University Museum, that of *emarginatus* Saund. in the British Museum.

113. **Calcodes latus.** (Plate XXI. fig. 3.)

Neolucanus latus Boil.,* Le Naturaliste, xxiv, 1902, p. 204.
N. brevis Boil., Bull. Soc. Ent. France, 1899, p. 197.
N. apricans Möll.,* Int. Ent. Zeitschr. v, 1912, p. 302.

Entirely black, the upper surface opaque except sometimes the middle of the pronotum, the scutellum and part of the elytra.

Rather short, parallel-sided, not very convex. The pronotum short and broad, with the side gently rounded to far beyond the middle, where it is very obtusely angulate, and from there gently concave to the obtuse hind angle. The elytra very broad at the base, the lateral margins distinctly flattened and very gently curved. The prosternal process very short but sharply pointed.

♀. The upper surface is entirely opaque. The *head* is rugosely punctured in front and at the sides and the canthus is rounded. The mandibles are strongly rounded externally and very bluntly toothed internally. The *mentum* is bare, very coarsely and closely pitted. The *tarsi* are rather shorter than the tibiæ.

♂. The *head* is larger than that of the female and finely coriaceous, a little depressed in the middle and emarginate in front, the canthus bluntly angular and not very prominent, the sides a little swollen behind the eyes. The mandibles are short, with the outer edge feebly curved and the inner edge serrate. The *mentum* is densely clothed with short yellow hairs. The middle and hind *tarsi* are as long as the tibiæ, the front and middle tibiæ have each a hooked spur and the middle tibia has a prominent tufted lobe at the end of its inner edge.

♂. *Length* (with mandibles), 29–38 mm.; (without mandibles) 26–34 mm.: *breadth*, 13·5–17 mm.

♀. *Length*, 15 mm.; *breadth*, 30 mm.

Assam: Kohima, Naga Hills. Burma: Cheba, Karen Hills, 1800–3500 ft. (*L. Fea*, Nov.); Thandaung, 5000 ft. (*O. C. Ollenbach*, July); Rangoon.

Type in the Genoa Museum, co-type in Dr. Didier's collection, type of *apricans* Moll. in M. René Oberthür's collection.

114. **Calcodes brevis.** (Plate XXI, fig. 9.)

Neolucanus brevis Boil.,* Bull. Soc. Ent. France, 1899, p. 197; Le Naturaliste, xxiv, 1902, p. 204.
N. birmanensis Möll., Notes Leyd. Mus. xxii, 1900, p. 46; Zang, Deuts. Ent. Zeitschr. 1905, p. 212.

Entirely black, opaque above, except at the middle of the pronotum, the scutellum, and adjoining part of the elytra. Rather short-bodied, with the head large, and the pronotum not very closely applied to the elytra, which are narrow at the base. The head broad and opaque, the canthus rounded but very prominent laterally, and the sides of the head a little

swollen behind the eyes. The mandibles very short and broad. The pronotum with strongly raised lateral and basal margins, the sides gently rounded to beyond the middle, very bluntly angular there, and then feebly concave to the very obtuse hind angles. The elytra relatively small, a little narrowed at the shoulders, which are rounded, and the sides distinctly flattened and rather strongly rounded. The prosternum feebly produced and acute.

♀. The *head* is flat and rugosely punctured, with the canthus laterally prominent and narrow. The mandibles are very short, broader than they are long, coarsely punctured and not reflexed at the tip. The *mentum* is coarsely punctured and bears only a few hairs. The *legs* are a little shorter than those of the male, and the tarsi are distinctly shorter than the tibiæ.

♂. Very similar to the female, but the *head* is smooth, opaque and a little larger and less transverse, with the canthus broader and more rounded. The mandibles are very short but more strongly serrate at the inner edge, and reflexed at the tip. The *mentum* is entirely covered with short erect reddish hairs. The front *tibia* is a little longer than that of the female, its terminal spur is hooked, and the middle tibia has also a hooked terminal spur, as well as a small tuft of yellow hairs at the end of its inner edge.

Variation of the male. I have seen only two males, in both of which the mandibles are shorter than the head. In the smaller specimen (in the British Museum) the inner edges of the mandibles are in contact throughout. In the larger example (from the Genoa Museum) they are separated except at the tips.

♂. *Length* (with mandibles), 30 mm. ; (without mandibles) 26 mm. : *breadth*, 13 mm.

♀. *Length*, 25 mm. ; *breadth*, 12 mm.

Burma : Cauri, Kachin Hills (*L. Fea*) ; Thandaung, 5000 ft. (*O. C. Ollenbach*, July).

Type in the Genoa Museum, co-type in the British Museum.

115. **Calcodes baladeva.** (Plate XXI, figs. 1–3.)

Odontolabis baladeva Hope,* Trans. Linn. Soc. xix, 1843, p. 105.
Lucanus angulatus Hope & Westw.,* Cat. Luc. Col. 1845, p. 17.
Neolucanus saundersi Parry, Trans. Ent. Soc. Lond. 1864, p. 20, pl. 9, fig. 3 ; Leuthner, Trans. Zool. Soc. 1885, p. 431, pl. 85, figs. 9, 13, 16.
Neolucanus lama Leuthner, *op. cit.* p. 430, pl. 85, figs. 11, 12, 14, 15.
Neolucanus waterhousei Boil.,* Bull. Soc. Ent. France, 1899, p. 178 ; Trans. Ent. Soc. Lond. 1913, p. 247.
Neolucanus maximus Houlb., Insecta, ii, 1912, p. 193, figs. 1–11.
Neolucanus baladeva Did., Col. Luc. du Globe, 1929, p. 83.
Calcodes baladeva Arrow, Trans. R. Ent. Soc. 86, 1937. p. 243.
Neolucanus ollenbachi Did.,* Col. Luc. du Globe.

Very dark brown, with the head and sometimes the whole upper surface black. The surface above and beneath smooth

and devoid of hair or setæ, the head and the sides of the pronotum entirely opaque and the elytra moderately shining, except at the margins. The prosternum rounded behind and not produced, but occasionally there is a small conical process. The elytra not very broad, but have well-marked, flattened lateral margins. The legs not very slender.

♀. Oval and convex, not very broad. The *head* is closely punctured in front and very sparsely behind, with the canthus rather prominent laterally, but not angular. The mandibles are broad, but have acutely produced tips and about four blunt teeth. The *pronotum* is finely and densely granular, sometimes rather shining in the middle and lightly punctured there, the sides always completely opaque. The front angles are very blunt, the lateral margins gently rounded to well beyond the middle, where they are strongly but bluntly angulate, and then concave to the hind angles, which are well marked but not sharp. The *elytra* are very smooth, with the sides and apices opaque, the outer edges gently rounded. The *mentum* is closely rugose and bare and has on each side a strongly elevated oblique curved ridge. The *metasternum* and *abdomen* are rather closely punctured at the sides.

♂. Elongate and rather parallel-sided. The *head* is densely granular and opaque, without punctures, emarginate in front, the canthus rather sharply angular laterally but not very prominent, the sides of the head very gently rounded behind the eyes. The mandibles are very short and never reach a length much greater than that of the head. The *pronotum* is finely and closely granular, entirely opaque at the sides, very convex in the middle, scarcely shining there. The front angle is rather blunt, the lateral margin gently rounded to much beyond the middle, where it is strongly angulate but not spiniform, and concave to the hind angle, which is rather sharp. The *elytra* are rather narrow, with the sides nearly straight ; the surface is very smooth. The *mentum* is closely clothed with short erect reddish-yellow hair. The *metasternum* and *abdomen* are scarcely punctured. The *legs* are very little more slender than those of the female, but the spur of the front tibia and the outer spurs of the middle and hind tibiæ are very short and hooked.

Variation of the male. The mandibles of small specimens are about as long as the head, narrow and rather straight, curved only towards the tip and entirely serrate at the inner edge. In larger specimens the mandibles are rather compressed laterally and carinate on the upper surface, the carina ending abruptly before the tip. In well-developed examples the end of the carina is elevated into a sharp erect tooth. A slight conical elevation occurs at the base of the mandible close to the front margin of the head and in the rare large phase, called

saundersi, which is found together with the ordinary phase, this is enlarged and becomes an erect process with a truncate summit, the mandible is very strongly compressed, curved instead of straight, with its inner edge smooth in the basal part and serrate only towards the end. In this phase the front angles of the head are generally rather more acute than in the ordinary form, the front margin more nearly straight, the lateral angle of the pronotum generally blunter, and the prosternum more or less produced behind.

These features, however, cannot be relied upon as constant. Specimens have been found together with the common form both in India and Burma.

♂. *Length* (with mandibles), 43–66 mm. ; (without mandibles) 37–55 mm. : *breadth*, 17–26 mm.

♀. *Length*, 37–53 mm. ; *breadth*, 17–29 mm.

DARJEELING DISTR. : Mangpu (*E. T. Atkinson*) ; Pedong (*L. Durel*). ASSAM : Jaintia Hills (*C. Swinhœ*) ; Naga Hills (*O. C. Ollenbach*) ; Manipur (*W. Doherty*). BURMA : Cheba, Karen Hills, 2700–3300 ft. (*L. Fea*).

Types of *baladera* and *angulatus* in the Hope Department, Oxford University Museum ; those of *waterhousei* and *ollenbachi* in the British Museum ; that of *parryi* in M. René Oberthür's collection.

This species is very common in the Darjeeling District during July and August. It is not, as was long supposed, the *Lucanus lama* of Olivier, the original figure of which is a very bad one. Examination of the type specimen of that insect in the Paris Museum has shown it to be, as Dr. Didier supposed, a female of the Philippine *Calcodes alces* F. The name *Neolucanus maximus* was given by Pouillaude to the large male phase (*saundersi*) and small males were called *angulatus* by Hope. The types of *waterhousei* Boil. and *ollenbachi* Did. are small males of reddish colour, perhaps a little immature.

116. **Calcodes dalmani.** (Plate XIX, figs. 3, 6.)

Lucanus dalmanni Hope & Westw.,* Cat. Luc. Col. 1845, p. 17.
Odontolabis dalmani Leuthner, Trans. Zool. Soc. Lond. 1885, p. 439, pl. 87, figs. 4–7.

Very deep chocolate-brown, with the mandibles, head, thorax and legs black or almost black, the male clothed, fairly closely upon the elytra, with very minute rusty-yellow setæ, the female almost bare. Moderately elongate, convex, with the prothorax bilobed on each side and the elytra rather shining. The prosternum produced behind and forming a rather sharply pointed cone. The front tibia rather broad at its anterior end.

♀. Nearly black, shining, elongate-oval. The *head* is opaque unevenly rugosely punctured and strongly, but not angularly, produced laterally. The *pronotum* is densely granular and

opaque at the sides, shining and finely unevenly punctured in the middle. The sides are obtusely angular before the middle, strongly and sharply behind the middle, and the hind angles are sharp but not produced. The *elytra* are minutely punctured and very glossy except at the extreme outer margins and apices, which are more strongly and closely punctured. The lower surface of the *body* is rather smooth and shining. The *mentum* is coarsely rugose.

♂. Rather narrowly elongate, dark brown, clothed with rusty-yellow very fine setæ, rather scanty upon the sides of the head and pronotum, and close upon the elytra. The *head* is not very broad, densely granular and opaque, strongly excised at its front margin, with the front angles well marked but blunt, the sides rather parallel in front and bearing a sharp spiniform process behind the eye. The mandibles are of simple form, flat, not strongly curved nor widely separated. The *pronotum* also is densely granular, but a little more feebly in its median part. The front angles are very blunt, the sides very strongly bilobed, the anterior lobe strong, the posterior one longer and more spiniform. The hind angles are sharp. The *elytra* are rather long and narrow, finely and rather closely punctured but shining. The *mentum* and *submentum* are densely granular. The *metasternum* is finely coriaceous and the abdomen well punctured.

Variation of the male. Small males have the mandibles short, with the inner edge entirely irregularly serrate. In medium-sized examples there is a serrate basal lobe, and the terminal half is also serrate and meets that of the other mandible. In large specimens the mandibles are about twice as long as the head, of similar form, but the serrate terminal part is only about a quarter of the total length.

♂. *Length* (with mandibles), 51–75 mm.; (without mandibles) 44–57 mm.: *breadth*, 20–24 mm.

♀. *Length*, 43 mm.; *breadth*, 20 mm.

TENASSERIM. MALAY PENINSULA. SUMATRA. BORNEO. JAVA.

Type in the Hope Department, Oxford University Museum.

117. **Calcodes carinatus.** (Plate XX, figs. 1–3.)

Scarabaeus carinatus L., Syst. Nat. ed. 10, vol. 2, 1758, p. 354.
Odontolabis cingalensis Parry, Trans. Ent. Soc. Lond. (3) 2, 1864, p. 16, pl. 10, fig. 8.
O. intermedius Deyr., Ann. Soc. Ent. France (4) 4, 1864, p. 314.
O. nigritus Deyr., *l. c.*
O. carinatus Leuthner, Trans. Zool. Soc. Lond. 1885, p. 474, pl. 97, figs. 7–14.
Calcodes carinatus Arrow, Trans. R. Ent. Soc. Lond. 83, 1935, p. 108; *op. cit.* 86, 1937, p. 241, pl. 1, fig. 4.

Black, with the head and the sides of the pronotum (sometimes the whole of the latter) dull, the front and hind margins

of the pronotum fringed with bright yellow hairs. The body fairly short and depressed, the elytra with rather rounded and flattened lateral margins. The prosternum a little produced behind and not sharp.

♀. The *head* is short and transverse, coarsely punctured in front, finely granular behind. The clypeal process is transverse and rounded. The *pronotum* has a narrow smooth, shining and finely punctured median area; the sides are broadly coriaceous and dull; the front and hind margins closely punctured, the lateral angles not very sharp. The *elytra* have a smooth shining dorsal area and broad opaque outer margins. The front *tibia* is broad, with very feeble teeth.

♂. The *head* is long, densely granular and opaque, the front angles rounded, the sides parallel, except at the base of the head, where they diverge slightly. The clypeal process is bluntly pointed. The *pronotum* also is densely granular and opaque, but more so at the sides and sometimes shining along the middle line. The front angles are produced and fairly sharp, the sides rounded to beyond the middle, where there is a sharp angle, and strongly concave from this to the very acute hind angle. The *elytra* are smooth and shining, with the margins dull. The mentum is granular and thinly clothed with yellow hairs. The *legs* are long and slender, the front tibia a little curved, its extremity bearing a dense tuft of short yellow hairs internally and very feebly forked externally, the outer edge armed with a single minute spine or none, the middle and hind tibiæ bearing short fringes of yellow hair at the inner edge.

Variation of the male.—Variable phase. In small specimens the head is narrow, the mandibles are shorter than the head, simply rounded externally and irregularly toothed internally from base to apex. The front part of the head has a gentle declivity. In larger examples the declivity is steep, the mandible longer, with stronger and less numerous teeth and a gap appears between these near the base. In still larger males the mandibles are longer than the head and a second gap appears beyond the first tooth, which is drawn out into a horizontal process. In the large specimens the head is broader, especially in front, the anterior edge is straight and sharply ridged, and the declivity is hollowed or abruptly vertical.

Constant phase. Amongst 42 male specimens I have examined are 13 belonging to another phase, in which the mandibles are much longer than the head, slender, strongly rounded externally, and without either basal prominence or horizontal tooth internally, the inner edge being uninterrupted to beyond the middle, where there is a truncate or double-cusped oblique branch. The apex is forked and there are one or two minute denticulations in the fork. The head is rather

broad and a little dilated in front, with its front edge straight and sharply ridged. Specimens of this phase may be slightly larger or a little smaller than the largest examples of the inconstant phase and both phases occur together. The strong 2-cusped branch of the mandible in the constant phase has no apparent correspondence with the median tooth found in large specimens of the variable phase, which is pointed, has a downward direction and is placed before instead of after the middle.

♂. *Length* (with mandibles), 30–67 mm. ; (without mandibles) 27–47 mm. : *breadth*, 12–21 mm.

♀ *Length*, 23–34 mm ; *breadth*, 11–16 mm.

CEYLON : Maskeliya (*E. E. Green*, March) ; Ohiya, W. Haputale (May) ; Mousakande (June) ; Bulutota (May) ; Haldumulla ; Labugama (Aug.).

Type in the Uppsala University Museum.

There seems to be no reason to doubt that *C. carinatus* is confined to Ceylon, although owing to careless labelling of specimens it has long been believed to inhabit the mainland of India, and even to range as far as Calcutta.

Deyrolle considered that three species could be distinguished amongst the forms here united and Boileau, whilst rejecting *intermedius* Deyr., believed that the very smooth and shining specimens called by Deyrolle *Odontolabis nigritus*, formed a distinct species. Comparison of a very large series, many of them kindly lent by Mr. C. Henry, of the Colombo Museum, appears to me to show conclusively that no breaks whatever occur except that between the two male phases.

118. **Calcodes æratus.** (Plate XX, figs. 8–11.)

Calcodes æratus Westw. (undescribed), Ann. Sci. Nat. (2) 1, 1834, p. 118 ; Arrow, Trans. R. Ent. Soc. Lond. 86, 1937, p 241, pl. 3, fig. 3.

Lucanus æratus Hope,* Trans. Zool. Soc. 1, 1835, p. 99, pl. 14, fig. 2.

Odontolabis æratus Leuthner, Trans. Zool. Soc. Lond. 1885, p. 473, pl. 97, figs. 4–6.

Coppery, with variable greenish or purplish reflections, the upper and lower surfaces dull in the male, more shining in the female. The body rather short and broad, not very convex, the legs fairly long.

♀. Darker in colour than the male and shining except at the sides and extremities. The body is oval, more convex than that of the male, with much shorter legs. The *head* is closely punctured, rugose in front, bluntly produced laterally, with fairly large eyes. The *pronotum* is rather strongly punctured, closely at the sides but not in the middle. The front angles are not very sharp, the sides are gently rounded to the lateral

angles, which are very blunt, and a little concave to the basal angles, which are well marked. The *elytra* are finely and rather closely punctured and dull, except upon a triangular basal area the apex of which nearly reaches the middle of the suture, where they are shining and less punctured. The *mentum* is very coarsely punctured and not hairy. The *prosternum* is strongly elevated between the coxæ, short and rounded behind. The *metasternum* and *abdomen* are shining, strongly punctured at the sides and finely in the middle. The front *tibia* is broad, bluntly bifurcated at the end and scarcely perceptibly toothed at the side.

♂. The *head* is finely and densely granular, except at the sides, where it is coarsely rugose, the sides are rounded in front and feebly rounded behind the eyes. The *pronotum* is very finely and densely granular, with the front angles rather sharp, the sides diverging, at first strongly, then less strongly, to the lateral angles, which are very prominent, and then strongly concave to the basal angles, which are very sharp. The *scutellum* is rather shining. The *elytra* are very finely and fairly closely punctured, the punctures distinct upon the inner part, finer and less distinct upon the outer part. The outer margins are rounded and rather broadly flattened. The lower surface is finely coriaceous, opaque at the sides and shining in the middle. The *mentum* is densely clothed with fairly long yellow hairs. The *prosternum* is produced behind into a downward pointing process. The *tibiæ* are fairly stout, the front ones rather long and gently curved, the short terminal fork succeeded by two extremely minute lateral spines. The middle and hind tibiæ bear close fringes of yellow setæ at the inner edge and the long tarsi are clothed beneath with rather long yellow hair

Variation of the male.—Variable phase. The head is long and the mandibles are short, in close contact, gently curved externally, acutely pointed at the tip and bearing a few short stout teeth at the inner edge. The front margin of the head is strongly excised and the clypeal process small and narrow. In the smallest specimens the mandibles are about half the length of the head, and in full-sized males about three-quarters of its length, otherwise there is little difference.

Constant phase. The head is short and broad, and the mandibles are long, slender, far apart at the base, strongly and evenly rounded, enclosing a nearly circular space when in contact at the tips, which consist of two nearly equal short branches. The inner edge of the mandible is unarmed basally for less than half of its length and the remaining part is finely, closely and evenly toothed, the first tooth a little larger than the rest and placed upon a rather higher level. The clypeal process is rather broad and rectangular.

♂. *Length* (with mandibles), 14–30 mm.; (without mandibles) 13–23 mm : *breadth*, 6–11 mm.

♀. *Length*, 15–18 mm.; *breadth*, 7–8 mm.

TENASSERIM. MALAY PENINSULA.

Type in the Hope Department, Oxford University Museum.

This rather peculiar and isolated species, which has been found in considerable numbers in the Malay Peninsula, is especially remarkable for the complete contrast between the two male phases, the very unusual form of the mandibles in the constant phase and their feeble development in the inconstant phase. The largest examples I have seen belong to the latter, which is more abundant than the former.

Genus **HETEROCHTHES.**

Heterochthes Westw., Trans. Ent. Soc. Lond. (3) ii, 1864, p. 17; Leuthner, Trans. Zool. Soc. Lond. 1885, p. 479.

TYPE, *Heterochthes brachypterus* Westw.

Range. Cambodia, Andaman Is.

Body short and broad, with the legs not long, the tarsi very short and thin. Eyes completely divided by the canthus and the upper and lower halves very small; the head a little swollen behind the eyes in both sexes. Pronotum short, with the sides vey bluntly angulate and hind angles absent. Elytra very short, with rounded sides and blunt shoulders. Middle and hind tibiæ short, without lateral spines. Prosternum grooved between the coxæ, slightly compressed behind but not very prominent. Clypeal process extremely short.

♂. Head very broad, not emarginate in front, feebly prominent in front of and behind the eyes. Elytra extremely short. Front tibiæ slightly elongate. Antennæ rather short.

♀. Head bluntly prominent in front of the eye. Mandibles narrowed beyond the base, broad and opposable at the end, leaving an intermediate gap.

Heterochthes differs markedly from *Calcodes* by its peculiar shape, very small eyes, the complete absence of hind angles to the pronotum, the short thin tarsi, abbreviated elytra of the male and peculiarly shaped mandibles of the female.

119. **Heterochthes andamanensis.** (Plate XXI, figs. 10–12.)

Heterochthes andamanensis Westw.,* Trans. Ent. Soc. Lond. 1874, p. 359, pl. 3, fig. 2: Leuthner, Trans. Zool. Soc. Lond. 1885, p. 480, pl. 84, figs. 9–12.

Black, with the elytra very dark brown, the tibiæ and tarsi bearing inconspicuous pale hairs.

♀. The *head* is rather finely punctured and opaque, except behind and at the sides, where it is very coarsely punctured and shining. It is strongly and almost angularly dilated on each side in front. The mandibles are fairly long, very coarsely

and closely punctured, narrowed beyond the base, leaving a wide gap between them, dilated, serrate and capable of close contact in the terminal half and acute at the tip. The *pronotum* is more shining than that of the male, strongly punctured at the sides and base, and finely in the dorsal part. The *elytra* are relatively a little longer than those of the male. The front *tibia* is rather broad, with very strong lateral teeth.

♂. The *head* is very short and broad, finely coriaceous and opaque, with very large punctures at the sides behind the eyes. The front margin is almost straight in the middle, the sides project outwards a little beyond the eye and are feebly angulate behind the eye. The *pronotum* is also finely coriaceous and opaque, with the sides coarsely pitted and rugose. The front angles are blunt, the sides nearly straight to far beyond the middle, where they are very bluntly angulate, and almost straight to the base. The *elytra* are conjointly almost as wide as they are long, very smooth and glossy, with the sides and apices closely punctured, and the lateral margins well rounded. The *legs* are scarcely longer than those of the female, except the front tibia, which is slightly elongate with sharp lateral teeth.

Variation of the male. In small males the mandibles are about as long as the head, rather triangular in shape, almost straight externally, the terminal half slightly bent upward and closely set internally with fine co-adapted teeth, the basal half bearing on a higher level two larger and very blunt teeth, not meeting those of the opposite side, the closed mandibles showing a wide basal gap. In larger specimens the gap is larger, a single strong tooth remains beyond the base and the terminal teeth are reduced in number. At a further stage the mandibles are gently curved externally and meet only at the tips, the single tooth is reduced and farther from the base. The, mandibles become longer and the single tooth, still diminishing, removes nearer to the apex than the base, and finally the mandibles are slender, twice as long as the head, quite devoid of teeth but a little hooked at the tip. The head increases in breadth according to the size of the specimen and is very broad in large examples.

♂. *Length* (with mandibles), 29–40 mm.; (without mandibles) 25–31 mm.: *breadth*, 13–16 mm.

♀. *Length*, 31 mm.; *breadth*, 14 mm.

ANDAMAN ISLANDS (*Capt. Wimberley*, *Rœpstorff*).

Type in the Hope Department, Oxford University Museum.

Subfamily FIGULINÆ.

Figulitæ Thoms., Ann. Soc. Ent. France (4) ii, 1862, p. 391.

Usually small, parallel-sided and rather narrow-bodied insects, alike in both sexes. Antennæ composed of 9 or 10

joints, the club composed of 3 very short, scarcely movable joints, usually very hard and chitinous. Legs not very long, the tarsi without pulvillus. Scutellum small, narrow and acute-angled, sometimes wanting. Canthus strongly developed, completely dividing the eyes into upper and lower halves. Mandibles not very long, sometimes short and simple. Maxilla with the inner lobe terminating in both sexes in a strong chitinous hook. Ligula forming two slender divergent lobes; labial palpi with a long basal joint.

This group is especially noteworthy for the fact that the two sexes are alike. Although in the genus *Nigidius* the mandibles bear antler-like processes above, these are not, as is usual, peculiar to the male.

The short rigid joints of the antennal club peculiarly hard and smooth.

Key to the Genera of FIGULINÆ.

1	(6)	Body not extremely flat; middle and hind tibiæ bearing lateral spines.	
2	(3)	Scutellum distinct, triangular; mandible with appendage above	NIGIDIUS Macl., p. 213.
3	(2)	Scutellum invisible or reduced to a narrow vestige: mandible without appendage.	
4	(5)	Front femur not very short and broad	FIGULUS Macl., p. 219.
5	(4)	Front femur very short and broad	CARDANUS Westw., p. 226.
6	(1)	Body extremely flat; middle and hind tibiæ without lateral spines	PLATYFIGULUS Arrow, p. 227.

Genus **NIGIDIUS**.

Nigidius Macl., Horæ Ent. i, 1819, p. 108.

TYPE, *Nigidius cornutus* Macl. (Malay Pedinsula).

Range. Africa, Madagascar and the Oriental Region.

Body rather cylindrical and parallel-sided, almost naked. Legs not very long, the front tibia with a short terminal fork and short, more or less equidistant, lateral teeth, the middle and hind tibiæ each with several lateral spines. Tarsi without distinct pulvillus. Antennæ short, composed of 10 joints, a moderately long scape, a freely articulated 2nd joint, a very closely articulated 5-jointed funicle and a club of 3 very short joints, completely chitinised, smooth and shining externally, the sensory area confined to the terminal portion of each. Head broad, the edges completely divided into upper and lower halves by the very prominent canthus. Mandibles short, each usually bearing an erect process arising near the base and

curving inwards at the end. Inner lobe of the maxilla with a strong chitinous hook at the end in both sexes; the outer lobe broad, rounded, bearing a long close marginal fringe of stiff hairs; maxillary palpus fairly long, the terminal joint about as long as the preceding two together. Mentum transverse, bilobed; ligula divided into two strongly diverging slender lobes, with long fringes at the anterior edge; labial palpus with 1st and 3rd joints long, the 1st very slender, the 2nd short. Pronotum more or less rectangular and parallel-sided, without lateral angulation, finely margined at the sides and base. Scutellum distinct, narrow, acute at the apex. Elytra parallel-sided, convex, striate or broadly sulcate with narrow intervals Prosternum little elevated behind the front coxæ.

The two sexes are alike in this genus.

With very few exceptions all the species are recognizable by the remarkable appendage arising near the base of each mandible.

Key to the Species of Nigidius (male and female).

1	(10)	Pronotum with a broad, strongly punctured front margin.	
2	(9)	Body rather long and narrow.	
3	(6)	Sides of the head straight or concave.	
4	(5)	Lateral angles of the head sharp	*distinctus* Parry, p. 214.
5	(4)	Lateral angles of the head blunt	*birmanicus* Boil., p. 215.
6	(3)	Sides of the head rounded.	
7	(8)	Base of the mandibles with a posterior lobe	*himalayæ* Grvl., p. 216.
8	(7)	Base of the mandibles without posterior lobe	*elongatus* Boil., p. 217.
9	(2)	Body very short and broad . . .	*dawnæ* Grvl., p. 217.
10	(1)	Pronotum with a narrow, shining front margin	*impressicollis* Boil., p. 218.

120. **Nigidius distinctus.** (Plate XXII, fig. 11.)

Nigidius distinctus Parry,* Trans. Ent. Soc. Lond. 1873, p. 341, pl. 5, fig. 7.
Nigidius andamanus Kriesche, Arch. f. Nat. lxxxvi, A, pt. 8, 1921 (1920), p. 105.

Black and shining above and beneath, the body convex, cylindrical and moderately elongate. The *head* is broad, uneven, coarsely, closely and unequally punctured, with a wide smooth area between the eyes, the region behind the eyes rather finely and evenly punctured. The lateral margin of the head is concave and produced in front and behind into a rather blunt angle. The mandibular process is simple, rather narrow, strongly curved and not lobed at the base. The *pronotum* is moderately broad and has a rather well-defined, broad,

coarsely punctured front margin, divided in the middle by a sharp longitudinal ridge. The lateral margins are straight and parallel to well beyond the middle, and then converge almost rectilinearly to the hind angles, which are very blunt; the base is gently trisinuate; the front angles are broadly rounded. There is a strong longitudinal median groove reaching the median carina in front and containing numerous strong punctures. The sides are strongly, closely and very broadly punctured, and the narrow space between the median groove and the strongly punctured sides is finely but distinctly punctured. The *elytra* bear strongly elevated narrow costæ and each interval contains a regular row of large round shallow pits and a series of fine and less regular punctures on each side. The apices are densely and coarsely pitted and opaque. The *mentum* is coarsely rugose and the *submentum* coarsely pitted. The *prosternum* is closely rugose, the *metasternum* very coarsely and closely pitted at the sides and sparsely punctured in the middle. The *abdomen* is rather strongly punctured, more closely in the middle than at the sides.

Length (with mandibles), 12–16 mm.; *breadth*, 5–6 mm.

ASSAM: Tura, Garo Hills, 1200–1500 ft. (*Dr. Stanley Kemp*, June, July); Duars (*Dr. C. F. C. Beeson*). ANDAMAN ISLANDS (*Roepstorff*). MALAY PENINSULA. TONKIN.

Type in the British Museum.

Dr. Beeson found this species in dead Malatta Wood (*Macaranga pustulata*).

121. **Nigidius birmanicus.** (Plate XXII. fig. 10.)

Nigidius birmanicus Boil.,* Trans. Ent. Soc. Lond. 1911, p. 446.

Black and shining, the body moderately elongate, convex and clyindrical. The *head* is strongly, closely and unevenly punctured in front, with a small, smooth depression on each side, and has a finely and closely punctured band behind the eyes, with a broad, smooth area in the middle. The canthus is broad and rectangular in front, with the lateral margins nearly parallel, the front angle blunt, the hind angle strongly produced at a right angle with the head, the apex rather blunt. The mandible bears a simple strongly curved appendage above. The *pronotum* has a rather broad, closely punctured anterior marginal band, divided in the middle by a sharp longitudinal ridge. There is a deep, irregularly punctured median groove, extending from the front marginal band almost to the base, and the sides between the groove and the lateral margins are punctured, strongly and closely except near the groove, where the punctures are very fine. The front angles are produced and broadly rounded, the sides straight and parallel to beyond

the middle and gently concave from there to the base. The *elytra* bear strongly elevated narrow shining costæ and each interval contains a row of very large, round, shallow pits, on each side of which is a row of fine punctures. The apices are closely and rugosely punctured. The *mentum* is transversely rugulose, the *submentum* coarsely rugose, the *metasternum* finely punctured in the middle, coarsely rugose at the sides, and the *abdomen* rather finely punctured.

Length, 17 mm. ; *breadth*, 6 mm.

Burma : Rangoon.

Type in the British Museum.

122. **Nigidius himalayæ.** (Plate XXII, fig. 9.)

Nigidius himalayæ Gravely,* Rec. Ind. Mus. xi, 1915, p. 429, pl. 29, fig. 6.

Black and shining above and beneath, the body elongate, convex and cylindrical. The *head* is broad, uneven, coarsely and closely but unequally punctured, with a smooth transverse posterior strip behind the eyes. The canthus is produced obliquely backward as a pointed beak-like process with its outer margin rounded. The mandibles bear blunt erect processes above, curving towards each other at the apex and bluntly lobed near the base. The *pronotum* is broad, with a broad well-defined coarsely punctured front marginal band, divided in the middle by a sharp longitudinal ridge. The lateral margin is gently dilated and broadly hollowed in the anterior half ; the front angles are rounded ; the base narrowed and gently rounded. There is a narrow and rather shallow median groove, not reaching the front or hind margin and very finely and scantily punctured. The sides are very broadly, strongly and fairly closely punctured, and the space between the punctured sides and the median depression is sparsely and minutely punctured. The *elytra* bear strongly elevated narrow costæ and each interval contains a row of very large closely contiguous shallow rounded pits, with finer and less regular punctures on each side. The apices are flat, densely pitted and opaque. The *mentum* and *submentum* are coarsely rugose. The *prosternum* is rugose in front, the *metasternum* is very closely and coarsely pitted at the sides and very finely and sparsely punctured in the middle, and the *abdomen* is strongly punctured.

Length (with mandibles), 15–19 mm. ; *breadth*, 5·5–7 mm.

East Himalayas : Pashok, Darjeeling District, 1000 ft. (*L. C. Hartless*). Bengal : Samsingh, Kalimpong, 1800 ft. (*Balwant Singh*, Nov.). Burma : Upper Chindwin (*C. R. Robbins*, Nov.).

Type in the Indian Museum, Calcutta.

123. **Nigidius elongatus.** (Plate XXII. fig. 8.)

Nigidius elongatus Boil., Le Naturaliste, xxiv, 1902, p. 205.

Black and shining above and beneath, with the body rather narrowly elongate, convex and cylindrical. The *head* is very broad, with the whole middle part semi-circularly hollowed and coarsely, unequally punctured, with an almost smooth anterior median patch and a slight rounded elevation on each side behind the front margin. The canthus is strongly and evenly rounded, broadest behind, where it is truncated at a right angle. The mandibular processes are rather slender, strongly curved inwards, not lobed at the base, but bearing a very small lobe at the inner edge just before the tip. The *pronotum* is extremely smooth but has a well-defined, coarsely but sparsely punctured, dull, broad front marginal band, divided in the middle by a longitudinal ridge. The lateral margins are strongly and abruptly dilated, straight and parallel in the anterior half, first strongly rounded and then feebly concave in the posterior half; the hind angles are extremely blunt and the base is feebly rounded. There is only a faint vestige of a median depression containing a few minute punctures. The sides are broadly punctured, very strongly and closely except in the inner part, when the puncturation becomes fine and scanty. At the outer margins it is rugose. The *elytra* bear three very strong closely punctured dorsal grooves with convex shining intervals. These are succeeded laterally by broad grooves, containing very large shallow contiguous pits, and separated by very narrow ridges. The outer margins and apices are densely punctured and opaque. The *mentum* and *submentum* are very coarsely and densely pitted or honeycombed. The *metasternum* is rugosely punctured at the sides, but has only a few very fine punctures in the middle. The *abdomen* is shining, with large punctures near the front and hind margins of each sternite, except in the middle, where they are fairly closely punctured.

Length, 18 mm.; *breadth*, 7 mm.

Burma: Ruby Mines (*W. Doherty*); Cheba, Karen Hills, 2700–3300 ft. (*L. Fea*, Dec.); Rangoon (*F. J. Meggitt*).

Type in the Genoa Museum.

124. **Nigidius dawnæ.** (Plate XXII, fig. 7.)

Nigidius dawnæ Gravely,* Rec. Ind. Mus. xi, 1915, p. 427, pl. 29, fig. 7.

Black, very shining above, opaque beneath, convex, cylindrical, very short and broad. The tarsi are very short. The *head* is broad and uneven, coarsely and unequally punctured, with a very small smooth anterior space on each

side. The canthus is abruptly produced outward in the anterior part of the head, forming a strong horizontal lobe, rounded in front and bluntly angular behind. The mandibles bear strong erect processes, curving towards each other at the apex and strongly lobed behind at the base. The *pronotum* is short and has a closely punctured front marginal band in its median part and a strongly punctured narrow median groove. The sides are very broadly, strongly and closely punctured, and the space between the punctured area and the median groove is very minutely and sparsely punctured. The sides and base are strongly margined, the anterior part of the lateral margin for rather less than half the length rather abruptly dilated and thickened, the posterior part nearly straight, the front angles very obtuse, the hind angles broadly rounded and the base gently curved. The *elytra* are very short and bear strongly elevated narrow shining costæ, with the intervals closely punctured, each containing a chain of rather large contiguous pits and a series of smaller and less regular punctures on each side. The apices are coarsely and closely pitted and opaque. The lower surface of the body is densely punctured or rugose, except parts of the head, the *mentum* very coarsely rugosely punctured, the *metasternum* coarsely rugose at the sides and strongly punctured in the middle, the *abdomen* rugosely punctured, except the last sternite, which is more finely punctured.

Length (with mandibles), 15 mm.; *breadth*, 6 mm.

BURMA: Misty Hollow, west side of Dawna Hills, 2200 ft. (*F. H. Gravely*, Nov.).

Type in the Indian Museum; co-type in the British Museum.

Dr. Gravely found adults and larvæ in one piece of hard dry wood on the higher slopes of the Dawna Hills.

125. Nigidius impressicollis.

Nigidius impressicollis Boil., Le Naturaliste, xxvii, 1905, p. 60.

Black and shining above and beneath, the body cylindrical and convex, not very elongate. The *head* is very broad, depressed in the middle, strongly and evenly punctured, very smooth and shining in front. The canthus is strongly and evenly rounded, broadest behind, where it forms a rounded lobe. The mandibular process is very strongly curved inwards and broadly lobed at the base behind. The *pronotum* is broad and surrounded by a marginal groove, deepest on each side of the trisinuate front margin. There is a median tubercle a little behind the front margin and a deep short oval depression, containing scattered punctures, behind it, not reaching the tubercle or the base. There is also a small deep roundish

depression on each side of the median one in the anterior half, usually another less sharply defined, strongly punctured depression between the last and the lateral margin, and a punctured area, more or less depressed, lying behind the two last-mentioned areas. There are a few other scattered punctures in the lateral part and strong punctures in the marginal groove. This is dilated at the front angles, which are well defined, and the lateral margin is very strongly rounded about the middle and feebly concave to the hind angles, which are very ill-defined. The base is feebly rounded. The *elytra* bear strong narrow shining costæ and each interval contains a row of large, closely contiguous, round shallow pits and numerous fine and less regular punctures on each side. The apices are densely punctured. The *mentum* and *submentum* are coarsely and closely punctured. The *metasternum* is smooth in the middle and very coarsely punctured at the sides and the *abdomen* very strongly, more coarsely and less closely at the sides.

Length, 14–17·5 mm. ; *breadth*, 5·5–6·5 mm.

Assam : Maflong, Khasi Hills, 5900 ft. (*Dr. Stanley Kemp*, Sept.).

Type in the Paris Museum.

Dr. Kemp found the larvæ and adults of this species together in thoroughly damp and rotten wood.

Genus **FIGULUS.**

Figulus Macl., Horæ Ent. i, 1819, p. 109 ; Lacord. Gen. Col. iii, 1856, p. 35.

Type, *Figulus confusus* Westw.

Range. Africa, Madagascar, the Oriental Region, Polynesia and Australia.

Body elongate, parallel-sided and generally a little depressed. Legs not long, the front femur not very broad, the front tibia with several nearly equidistant lateral teeth and short terminal fork, the middle and hind tibiæ each with two or more lateral spines, the tarsi without pulvillus. Antennæ very short, composed of 9 or 10 joints, a moderately long scape, a freely articulated 2nd joint, a nearly rigid funicle of 4 or 5 very short and closely articulated joints, and a club of 3 very short, strongly chitinised lamellæ, smooth and shining externally, the sensory surface being confined to the terminal portion of each. The head broad, the eyes completely divided into upper and lower halves by the fusion of the canthus with the posterior region of the head. Mandibles simple, not large, bluntly toothed at the inner edge. Inner lobe of the maxilla ending in a strong chitinous hook in both sexes, the outer lobe broad, rounded, bearing a long close marginal fringe of stiff hairs, the

maxillary palpus fairly long, the terminal joint about as long as the preceding two together. Mentum transverse, emarginate in front; ligula divided into two strongly diverging slender branches, with long fringes at the anterior edge; the labial palpi with the basal joint very long and slender, the 2nd short, the 3rd long. Pronotum more or less rectangular and parallel-sided, without lateral angulation, finely margined at the sides and base, generally with a median dorsal groove. Scutellum wanting or reduced to a very narrow vestige. Elytra narrow, with dorsal striæ and very narrow epipleuræ. Prosternum not much elevated behind the front coxæ and not pointed behind.

The two sexes do not differ externally, the only exception known to me being *Figulus caviceps*, the male of which has a very remarkable backward extension of the mentum.

A small but important distinctive feature of the genus is the reduction of the scutellum, which is either absent or represented only by a very narrow vestige. Various other distinctive features render the genus quite unmistakable, viz., the elongate shape, the strongly developed canthus completely dividing the eye and the very peculiarly formed club of the very short and compact antenna. The three-terminal joints have not the usual dull downy inner and outer faces, but are hard and shining, with the sensory surface confined to the hollowed terminal part alone of the very short joints.

Key to the Species of Figulus (male and female).

1	(12)	Body shining above, with the elytra striate.	
2	(11)	Elytral intervals broad and flat dorsally.	
3	(8)	Outer margins of the pronotum not, or only very minutely, punctured	
4	(5)	Head closely punctured	*cambodiensis* Deyr., p. 221.
5	(4)	Head not closely punctured.	
6	(7)	Abdomen well punctured; mentum rugose	*interruptus* Wat., p. 221.
7	(6)	Abdomen smooth; mentum smooth at the base	*horni* Zang, p. 222.
8	(3)	Outer margins of the pronotum strongly punctured.	
9	(10)	Pronotum with an anterior median tubercle; head without tubercle	*andamanus* Kriesche, p. 223.
10	(9)	Head with a median tubercle; pronotum without tubercle	*caviceps* Boil., p. 223.
11	(2)	Dorsal intervals of the elytra convex	*aratus* Arrow, p. 224.
12	(1)	Body not shining above; elytra with narrow costæ.	
13	(14)	Not entirely opaque above...	*linearis* Did., p. 225.
14	(13)	Entirely opaque above......	*cicatricosus* Boil., p. 225.

126. Figulus cambodiensis.

Figulus cambodiensis Deyr., Trans. Ent. Soc. London, 1874, p. 414

Black, smooth and shining, rather narrowly elongate. The antennæ consist of nine joints. The *head* is broad, hollowed above, with fairly numerous large annular punctures but without distinct tubercles, the canthus very prominent, very obtusely angular in front, almost straight at the sides and rather obtusely angular behind, the ocular ridges sharply elevated. The *pronotum* is little wider than it is long, all the angles are rounded, there is a sharp tubercle behind the middle of the front margin, and a deep narrow longitudinal median groove extending from the tubercle almost to the hind margin and containing large punctures, and a deep triangular depression at the front margin a short distance from each front angle. The sides are strongly and rather closely punctured, but the punctures of the outer portion are minute. The *elytra* are deeply striate dorsally, the intervals are smooth and rather flat, the striæ closely and inconspicuously punctured; the sides bear rows of strong punctures and the apices are finely punctured and shining. The *mentum* is smooth, shining and convex at the base, hollowed and rugose in its anterior part. The *metasternum* and *abdomen* are very smooth in the middle and the sides, as well as the last sternite, are very strongly punctured.

Length, 9–10 mm.; *breadth*, 3 mm.

Burma. Cambodia.

Type in M. Oberthür's collection.

I have seen only two specimens, without precise locality.

127. Figulus interruptus.

Figulus interruptus Wat.,* Ent. Month. Mag. xi, 1874, p. 7.

Black, very smooth and shining, narrow and a little depressed. The antennæ are composed of 10 joints. The *head* is shining and bears strong and rather scattered punctures, leaving a small smooth area in front on each side. There is a rather stong tubercle on each side close to the front margin of the eye and a less widely separated posterior pair in line with the hinder margin of the eye. The canthus is only moderately prominent, gently rounded laterally, scarcely angulate in front and very obtusely behind. The *pronotum* is a little broader than it is long, with the sides straight in front and broadly rounded behind, the hind angles entirely obliterated. There is a well-marked median tubercle just behind the front margin and a narrowly oval median depression, rather finely punctured, not quite reaching the tubercle or the base. There is a broad lateral band of moderately fine and close punctures on each side

and the space between this and the outer edge bears only very minute and scanty punctures. The *elytra* are finely striate, with smooth flat dorsal intervals. The striæ are closely punctured and are replaced at the sides and upon the posterior part by fine disconnected punctures. The shoulders are acute. The *mentum* is broad and very coarsely rugose. The *metasternum* is smooth in the middle and strongly punctured at the sides ; and the *abdomen* is rather sparingly punctured.

Length, 10·5 mm. ; *breadth*, 3·5 mm.

INDIA.

Type in the British Museum.

Only the unique type specimen is known. It has been in the British Museum for over a century and its origin is uncertain.

128. **Figulus horni.**

Figulus horni Zang, Deuts. Ent. Zeits. 1905, p. 161.

Black, very smooth and shining, long and narrow. The antennæ consist of nine joints. The *head* is strongly but not closely punctured, hollowed in the middle, where there are a few large annular punctures, and with a small smooth area on each side towards the front. The canthus is very prominent, not distinctly angular in front and almost right-angled behind. The *pronotum* is almost as long as it is wide, its sides are almost straight and parallel, the front angles very blunt and the hind angles gently rounded. A deep, rather narrow, coarsely and closely punctured median groove extends almost to the front and hind margins, a small prominent tubercle separating it from the front margin. There is a broad band of large and rather close punctures on each side, but the outer margins are smooth and shining, as well as the intervals between the punctured areas and the median groove. The *scutellum* is invisible. The *elytra* are very deeply striate, the dorsal striæ narrow, very finely punctured and separating wide flat smooth intervals, the outer striæ containing larger punctures and the intervals more convex. The sides of the elytra bear rows of disconnected punctures and the apices are opaque and coarsely pitted. The lateral margins are feebly serrate at the base and the shoulders are acute. The *mentum* is transversely elevated, smooth at the base and closely rugose in front. The *metasternum* is very smooth, with large horseshoe-shaped impressions on each side ; the basal sternite of the abdomen bears similar impressions and the remaining sternites are smooth, each with a basal series of short elevations.

Length, 8–9 mm. ; *breadth*, 3 mm.

CEYLON : Habarane (*E. E. Green*, Oct.) ; Colombo, coast level (*G. Lewis*, April).

Type in the Entomological Institute, Dahlem, Berlin.

129. Figulus andamanus. (Plate XXII, fig. 2.)

Figulus andamanus Kriesche, Arch. f. Nat., lxxxvi A, pt. 8, 1920 (1921), p. 106.

Black and shining, moderately elongate. The antennæ consist of nine joints. The *head* is strongly punctured, hollowed in the middle, where the punctures are large but not close, the depression extending to the eye-ridge on each side. The canthus is rounded, not distinctly angular in front and obtusely behind. The *pronotum* is parallel-sided, a little wider than long and has a narrow, strongly punctured median groove, extending almost from the front to the hind margin, but with a minute tubercle separating it from the front margin. There is a strong, vaguely triangular depression at the front margin on each side. The sides are strongly and rather closely punctured, but there is a narrow, less strongly punctured outer margin, and a very smooth shining space between the strongly punctured area and the median groove. The front angles form rounded lobes, the sides are nearly straight and parallel, and the hind angles are broadly rounded. There is a narrow vestige of a *scutellum*. The *elytra* are very strongly and deeply striate, the dorsal striæ containing indistinct coalescing punctures, and the intervals broad, flat and very shining. The sides bear three or four rows of strong punctures, and the apices are strongly and closely punctured. The outer margins are finely serrate at the base and the shoulders are acute. The *mentum* is very smooth at the base, and hollowed and rugose on each side of the anterior part.

Length, 10–12 mm. ; *breadth*, 3–4 mm.

S. Andaman Is. : Chatham (*C. F. C. Beeson*). In rotten wood.

Type in Herr Kriesche's collection.

130. Figulus caviceps. (Plate XXII, fig. 3.)

Figulus caviceps Boil.,* Le Naturaliste xxiv, 1902, p. 205.

Black, shining, strongly punctured above, not very slender. The antennæ are composed of 10 joints. The *head* is not very broad, its lateral margins are evenly rounded, not diverging behind, the hind angles very blunt. The posterior part is elevated in the middle, forming a double hump, in front of which there is a depression, shallowly and not very coarsely or closely punctured, with a rounded median tubercle behind the front margin, and an oblique elevation on each side in front of the eye. Between the eyes and the posterior hump it is strongly punctured. The *pronotum* is broadly, coarsely and closely punctured on each side, the punctures extending to the entire outer edge. A strongly punctured longitudinal median depression, smooth in the middle, extends almost

from the front to the hind margin. There is no anterior tubercle. The surface bordering the median depression on each side is very finely punctured. The front angles are strongly rounded, the sides almost straight and parallel, and the hind angles broadly rounded, with a few fine serrations. There is a very narrow vestige of a *scutellum*. The *elytra* are strongly striate-punctate, but the juxta-sutural stria is uninterrupted. The punctures of the dorsal striæ are longitudinal, and those at the sides large and round. The dorsal intervals are flat and smooth. The apices of the elytra are very coarsely and closely punctured, and opaque. The *mentum* is hollowed and coarsely rugose. The *metasternum* is smooth in the middle and bears crescent-shaped impressions at the sides. The *abdomen* bears very large annular punctures at the sides and the last sternite is very strongly punctured.

♂. The *submentum* is produced backwards, forming a laminar appendage tapering to a point and curving downwards at the end.

Length, 9·5 mm. ; *breadth*, 3·5 mm.

DARJEELING DISTR. : Pedong (*L. Durel*). CENTR. PROV. : Supkhar, Balaghar (*B. M. Bhatia*, June). BURMA : Teinzo (*L. Fea*, May). TONKIN.

Type in the Genoa Museum.

The single type specimen from Teinzo is a female. The hook-like extension of the submentum of the male is a remarkable feature which, so far as I know, has no counterpart in the Lucanidæ.

131. **Figulus aratus.** (Plate XXII, fig. 1.)

Figulus aratus Arrow,* Trans. Ent. Soc. Lond. lxxxiii, 1935, p. 119 ; Ann. Mag. Nat. Hist. (11) vol. ii, 1938, pl. 4, fig. 4.

Black and shining, but strongly punctured above and beneath. The *head* is coarsely and almost rugosely punctured and bears three tubercles placed transversely behind the front margin. The lateral margins are evenly rounded. The *pronotum* is long and strongly punctured on each side, but with the lateral margins smooth and only very minutely punctured. There is a narrow median groove extending almost from front to hind margin and containing numerous large punctures. The front angles are blunt and a little produced, and the sides are nearly straight to beyond the middle, where they become serrate and obliquely convergent. The hind angles are distinct but obtuse. The *scutellum* is invisible or almost so. The *elytra* are deeply sulcate, with the sulci closely and strongly punctured and the intervals convex. The extremities are rough but not opaque. The *mentum* is hollowed and rugose in front and smooth behind. The *metasternum* is smooth in the middle and strongly punctured at the sides ; and the last

ventral sternite and the sides of the others are coarsely punctured, and the middle of the latter finely.

Length, 8–10 mm. ; *breadth*, 3 mm.

BENGAL : Calcutta (*F. H. Gravely*, June). S. INDIA : Nilgiri Hills, Hattikeri (*H. L. Andrewes*, Feb.). Found under bark.

Type in the British Museum.

A specimen was found by Dr. Gravely in a decayed coconut palm, together with larvæ of *Oryctes rhinoceros*. It seems probable that the presence of this specimen in Calcutta was due to accidental importation.

132. **Figulus linearis.**

Cardanus linearis Did.,* Col. Lucan du Globe, 1929, p. 81.

Black and shining, rather narrow, with a sparse clothing of very minute and inconspicuous pale setæ. The antennæ are composed of 10 joints. The *head* is densely and rugosely punctured, with an oblique ridge at the inner margin of each eye, which forms a shining elevation at its anterior end. The canthus is rounded in front, the outer margins being gently curved and slightly diverging towards the hind angles, which are blunt. The *pronotum* has a large oval depression in the middle, with a shining margin, and closely but irregularly punctured with large punctures. There is a shining tubercle just in front of the depression. The remaining surface of the pronotum is densely covered with large punctures. The front angles are produced into rounded lobes, the lateral margins are finely crenate and almost parallel to near the base, and then convergent, without forming a definite angle. The hind angles are extremely obtuse. The *elytra* are broadly and deeply grooved, with close large punctures in the grooves, forming imperfect double rows. The intervals form narrow shining ridges. The outer margins are serrate at the base, the shoulders acutely produced and the apices shallowly punctured and opaque.

Length (with mandibles), 9 mm. ; *breadth*, 3 mm.

MALABAR : Mahé.

Type in Dr. Didier's collection.

133. **Figulus cicatricosus.** (Plate XXII, fig. 4.)

Figulus cicatricosus Boil.,* Le Naturaliste, xxvii, 1905, p. 38.

Black, densely punctured and opaque above, the punctures filled with earthy matter, and closely punctured but shining beneath. The antennæ consist of 10 joints. The *body* is small, convex and not very elongate, the legs fairly stout, with short tarsi. The *head* is not very broad and only feebly hollowed in the middle. It is strongly and closely punctured,

with a sharp posterior ridge on each side adjoining the eye, the two ridges converging to the front, where they end abruptly at a distance from the margin. The canthus is rounded and rather obtusely angulate behind. The *pronotum* is very deeply, coarsely and confluently punctured, the punctures distinct in the middle but completely obliterated at the sides. There is a broad longitudinal median depression. The front angles are rounded, the lateral margins entirely serrate and almost straight to beyond the middle, where there is a very blunt angle, and feebly sinuate to the hind angle, which is very obtuse. The base is very gently rounded. There is no *scutellum*. The *elytra* bear rows of closely contiguous punctures, separated by rows of minute elevated granules, those of the alternate rows uniting to form ridges in the anterior part. The sutural margins are also elevated and form shining ridges. The *mentum* and the *prosternum* are very strongly punctured, the *metasternum* is densely rugose at the sides and densely and coarsely punctured in the middle, and the *abdomen* is very strongly and rather closely punctured.

Length, 8 mm. ; *breadth*, 3 mm.

S. India : Nilgiri Hills (*H. L. Andrewes*).

Type in the British Museum.

Genus **CARDANUS.**

Cardanus Westw., Ann. Sci. Nat. (2) i, 1834, p. 112 ; Arrow, Trans. Ent. Soc. Lond. lxxxiii, 1935, p. 121 ; id., Ann. Mag. Nat. Hist. (11) 2, 1938, p. 52.

Type, *Diastmus sulcicollis* Perty.

Range. Indo-Malayan Region.

Body very narrowly elongate, convex and cylindrical. Legs not long, all the femora with broad flanges partly covering the tibiæ in the contracted position, the front tibia with a broad terminal fork and fairly evenly spaced lateral teeth, the middle and hind tibiæ each with several stout lateral spines. Tarsi without pulvillus. Antenna short, composed of 10 joints, 1st not long, 2nd freely articulated, 3–7 very short and closely articulated, 8–10 very short, entirely chitinous, the sensory area confined to the terminal portion of each. Head not broad, the eyes completely divided. Mandibles small and simple, usually with a single tooth at the inner edge. Inner lobe of the maxilla bearing a strong horny hook, the outer lobe broad and rounded, with a long close marginal fringe of stiff hairs, the terminal joint of the maxillary palpus about as long as the preceding two. Mentum transverse. Ligula divided into two very slender and strongly diverging branches, with long fringes at the anterior edge : labial palpi with the 1st and 3rd joints long, the 1st very slender.

Pronotum generally as long as broad, finely margined at the

sides and base. Scutellum absent or reduced to a very narrow vestige. Elytra long and narrow, parallel-sided, with very narrow epipleuræ. Prosternum very little elevated behind the coxæ and not pointed.

The two sexes are alike externally.

The species of this genus have a very hard exterior, which is densely sculptured and usually quite opaque. The only Indian representative known to me is a specimen in the Calcutta Museum of *C. variolosus*.

134. **Cardanus variolosus.** (Plate XXII, fig. 5.)

Cardanus variolosus Arrow,* Trans. R. Ent. Soc. Lond. lxxxiii, 1935, p. 121.

Sooty-black, densely punctured and opaque, narrowly elongate and moderately convex. The *head* is strongly and densely punctured, slightly hollowed above, with a small smooth and shining area on each side towards the front margin, which is almost straight; the canthus is prominent, very bluntly angular in front and behind. The *pronotum* is almost as long as it is wide, coarsely and densely punctured, with a strong longitudinal median groove, abbreviated in front, where it meets a well-marked smooth round tubercle. The front angles are rounded and prominent, the lateral margins finely serrate, nearly straight, and slightly divergent to beyond the middle, where they are bluntly angular, and strongly convergent to the hind angles, which are distinct but obtuse. The *elytra* bear rather irregular rows of large closely packed punctures, separated by three or four longitudinal ridges on each side. The sutural margins are not elevated. The shoulders are very sharp. The lower surface is entirely covered with very large and close punctures.

Length (with mandibles), 15 mm.; (without mandibles), 14 mm.: *breadth*, 5 mm.

Assam: Rotung, 1400 ft. (*Dr. Stanley Kemp*, Dec.). Siam.

Type in the British Museum.

Found in rotting wood.

Genus PLATYFIGULUS.

Platyfigulus Arrow, Trans. R. Ent. Soc. Lond. lxxxiii, 1935, p. 117.

Type, *P. scorpio* Arrow.

Range. Unknown.

Extremely flat and rather narrow, with the legs not very slender, the middle and hind tibiæ without spines, but fringed with hairs at the inner and outer edges, the three basal joints of all the tarsi short and broad, with dense hairy pads beneath, the 4th joint minute and the 5th slender. Head broad, rounded laterally in front and narrowed behind, with the eyes

small, completely divided, and widely separated from the sides. Antennæ slender, with a club composed of three very short joints not completely chitinous externally. Prothorax very short, broad in front, narrowed behind, the sides strongly rounded, with very obtuse lateral angles. Elytra long and narrow, striate, with the shoulders acute. Body smooth. Mentum short, broadly bilobed in front. Ligula with two long, strongly diverging lobes, densely fringed in front, the palpi very long, the basal joint much longer than the other two together. Maxillæ short, the inner lobe bearing a horny hook, the outer lobe twice as broad as long, with a fringe of very long hairs at the end, the palpi moderately long, the last joint as long as the two preceding it. Prosternum flat, not elevated behind.

135. **Platyfigulus scorpio.** (Plate XXII, fig. 6.)

Platyfigulus scorpio Arrow, Trans. R. Ent. Soc. Lond. lxxxiii, 1935, p. 117, pl. 6. fig. 6.

Black or pitchy-black, smooth and shining above and beneath, with the head and pronotum opaque ; rather narrowly elongate. The *head* is broad, flat, smooth, with a few well-marked punctures behind the eye on each side. The eyes are very small ; the sides of the head are a little swollen behind the eyes and the anterior part of the head is uniformly curved at the side, gently reflexed and united with the posterior lobe, widely separating the eye from the outer margin. The mandibles are broad at the base, strongly bent before the middle, nearly straight externally to the tip and a little dilated internally, and the extremity is bilobed, the outer lobe sharply-pointed and the inner lobe shorter and blunter. The *pronotum* is short and broad, smooth and unpunctured, with the front angles produced but not very sharp, the sides gently rounded, very obtusely angulate beyond the middle and rounded to the base, without trace of hind angles. The *scutellum* is small and rather narrow. The *elytra* are narrower than the head or pronotum, rather parallel-sided, with very acute humeral angles, and each bears a strongly-impressed sutural stria and three pairs of dorsal striæ, the first pair feebler than the others and all minutely punctured. The sides and apices are strongly and densely punctured. The front *tibia* is moderately long and bears minute irregular teeth externally. The middle and hind tibiæ are rather flat, not at all slender, without lateral spines but fringed with very short close setæ.

♂. *Length* (with mandibles), 23 mm. ; (without mandibles) 18 mm. : *breadth*, 7 mm.

Ceylon.

Type in the British Museum.

Platyfigulus scorpio is a small insect with the mandibles of the

male remarkably developed for a creature of its size. They are strongly bent beyond the base and then almost straight, and there is a small internal tooth at the bend. The tips are not forked in the usual way, but a little thickened and divided in a manner curiously suggesting the pincers of a scorpion.

The extreme flatness of the body is the feature which first strikes the eye and the three basal joints of the tarsi are also flattened, assuming a form not found in any other genus of LUCANIDÆ, no doubt indicating, like the flattened body, an unusual mode of life. The sides of the head are dilated, so that the eyes are separated by as much as their own diameter from the outer edge. The prosternum is flattened between and behind the front coxæ, so that the fore-legs are rather widely separated. The antennæ are very slender, and the three terminal joints form a club not much wider than the foot-stalk.

The circumstances under which the unique specimen was discovered have not been recorded, and nothing is known of the habits of the insect. Its flattened form suggests that it may lurk beneath the loose bark of logs, where scorpions are also to be found. If this be so, it seems not impossible that it may have the habit of waving the mandibles in the manner of a scorpion with its chelæ, and that they may have an intimidating effect.

Subfamily ÆSALINÆ.

Æsalides, Lacord., Gen. Coleopt. iii, 1856, p. 39.

This group consists of only a few genera and appears to be primitive in its characters. It contains insects of rather small size, and the dimorphism is in general not greatly developed, although at its maximum in the Indian representatives. The shape of the body is convex and cylindrical, never at all flattened or depressed, and the elytra are generally striate and frequently clothed with short setæ, which may form a simple pattern. The base of the prothorax closely fits the base of the hind-body. There is a distinct labrum, not completely fused with the head. The maxillæ are reduced and not toothed.

The few widely scattered members of this group are probably the survivors of an anciently more numerous race.

Genus **CERUCHUS**.

Ceruchus Macl., Horæ Ent. 1819, p. 115; Lacord., Gen. Coleopt. iii, 1856, p. 40.

TYPE, *Lucanus tenebrioides* F.

Range. Europe; N. America; Japan; Western China and India.

Rather cylindrical in shape, not at all depressed, the legs and antennæ short in both sexes. Scape of antenna curved,

2nd joint globular, 3 and 4 about as long as wide, 5–7 very short and compact, 8–10 forming an abrupt short club, the club-joints soft, not polished. Sides of head beneath longitudinally keeled, the antenna scape occupying a groove between the keel and eye. Eye small, not prominent, entire. Labrum small, tongue-like with terminal tuft of long hairs. Mandibles close together, not reaching the sides of the head. Maxillæ reduced, narrow, unarmed in both sexes, the 2nd and 4th joints of maxillary palpi moderately long. Mentum transversely hexagonal; the ligula attached in front, not concealed, very small, notched, not bilobed; palpi with 1st joint minute, 2nd very long, 3rd much shorter. Pronotum entirely margined, the lateral and basal marginal grooves deep, the base almost straight, closely fitting the base of the elytra, the basal angles sharp. Scutellum wide, almost semi-circular. Elytra convex, almost parallel-sided, striate. Prosternum neither elevated nor produced behind. All the coxæ contiguous, the front ones extremely prominent. Front femur bearing a wide patch of silky golden hairs on its front face. Front tibia finely serrate externally, with sharp teeth at intervals set at right angles, the extremity not forked. Middle and hind tibiæ bearing several spines externally and truncate at the extremity. All the tarsi short and slight, clothed with long hairs beneath. Pulvillus well developed. Abdomen loosely articulated.

♂. The prothorax is short, broad and dilated in front. The head is broad, the mandibles long, not flat, a little hollowed internally, and clothed there with long horizontally-directed hairs. Both maxillary and labial palpi are long, the former as long as the antennæ.

The genus *Ceruchus* differs in many important points of its structure from all other Indian genera. Its members are of small size, but, unlike other genera, the species of which are small, the two sexes are very dissimilar. The most obvious peculiarity is in the attachment of the legs to the body, all three pairs being in contact in the middle line and the front coxæ protruding vertically. The close correlation of the base of the prothorax with the bases of the elytra seems to allow less lateral movement than usual. The organs of the mouth also diverge greatly from the normal form. Both maxillæ and labium are much reduced and seem only to form supports for the palpi. The proportions of the joints of the labial palpi are quite distinctive, as also is the elongation of all the palpi in the male. The strong ridge protecting the antenna on each side of the head beneath is also remarkable.

Key to the Species (males).

Elytra very lightly striate-punctate, the intervals scarcely convex .... *atavus* Fairm., p. 231.
Elytra deeply grooved, with strongly convex intervals.............................. *sinensis* Nagel, p. 232.

136. **Ceruchus atavus.** (Plate XXIII, figs. 3, 4.)

Ceruchus atavus Fairm., C.R. Soc. Ent. Belg. xxxv, 1891, p. 88.

Black and very shining, with the antennæ and tarsi dark red. Convex and rather narrow in shape, with the legs slight and short, and the antennæ very short. The head shining, a little depressed in front, very unevenly punctured, the punctures extremely coarse and confluent at the sides, fine and scattered in the middle. The head widest just behind the eyes and slightly narrowed in front and behind. The pronotum convex, strongly but not broadly margined at the sides, and only very feebly angulate, but with sharp hind angles, the base narrowly margined and almost straight. The scutellum bearing a few punctures. The elytra highly convex, with strongly marked outer margins, the shoulders sharply angular, the outer margins nearly straight and parallel, the apical margins forming a semi-circle. The surface lightly striate, the first two dorsal striæ deeper than the rest, the innermost stria entire, the remainder abbreviated behind, the 5th and 6th also abbreviated in front, the 7th and 8th very short. The striæ contain fine irregular scattered punctures, and the intervals bear similar, very irregularly scattered, punctures. The head strongly punctured beneath at the sides. The metasternum well punctured, with a deep oval impression in the middle. The abdomen strongly and closely punctured beneath.

♀. The *head* is much narrower than the thorax. The mandibles are rather long, sharply pointed, with a small tooth much nearer the tip than the base. The *pronotum* narrows a little to the front in its anterior part, the surface is fairly closely but unevenly punctured, and there is a transverse ridge crossing the middle, curving forward a little at each end, and not reaching the sides.

♂. The *head* is large, as wide as the thorax at the front margin, and is strongly depressed in its anterior part. The mandibles are very shining and rather strongly punctured, gently curved externally and sharply pointed at the tip, with a broad basal tooth internally, a strong sharp tooth behind the middle, directed upwards and inwards, and a slight conical downwardly directed tooth beneath a little beyond the base. The *pronotum* widens from the base to the front margin and is smooth above, with very scattered punctures. The front *tibiæ* are slightly elongate in the male, and the tarsi also are a little longer than those of the female.

Variation of the male. In the smallest specimen I have seen, the prothorax is scarcely wider in front than at the base, the head is of the same width and has a small rugose area on each side. The mandibles are about as long as the head. In the largest specimen the prothorax is much wider in front than at

the base, the head is still wider and has a large lateral rugose area. The mandibles are distinctly longer than the head, and the upper tooth is longer, and placed nearer the middle.

♂. *Length* (with mandibles), 14–19 mm. ; (without mandibles) 13–15 mm. : *breadth*, 6–6·5 mm.

♀. *Length*, 14 mm. ; *breadth*, 5·5 mm.

Kashmir : Gulmarg, 8500 ft. (*Dr. M. Cameron*, June ; *T. Bainbrigge Fletcher*, July) ; Khillenmurg, Gulmarg (*C. F. C. Beeson*, May) ; Lidarwat, Lidar Valley, 9000 ft. (*B. M. Bhatia*, June).

Type in the Paris Museum (probably).

Found beneath fallen logs and stones.

137. Ceruchus sinensis.

Ceruchus sinensis Nagel,* Stylops, ii, 1933, p. 226, fig. 5.

♂. Black and very shining, the antennæ and tarsi dark red, with yellow hairs, the abdomen scantily clothed with short setæ. Cylindrical and convex, parallel-sided, with short legs and very short antennæ. The *head* is broad and convex, with a deep, rather triangular depression in front, the front margin rather sharply pointed between the mandibles. The head is finely and scantily punctured behind and the sides are very deeply and coarsely rugose, forming seven or eight strong oblique parallel ridges. The mandibles are as in *C. atavus*, armed with a strong tooth just behind the middle, and directed obliquely inward and upward. The *pronotum* is very short and broad, rather more strongly punctured than that of *C. atavus*, completely margined, very deeply at the sides and base, the sides very feebly angulate behind the middle, the front angles produced, the hind angles sharp. The *elytra* are deeply grooved, the intervals strongly convex and fairly strongly but irregularly punctured. The sides are parallel, a little less broadly margined than those of *C. atavus*, the extremities semicircularly rounded. The *mentum* is very short and broad, very deeply hollowed.

The female is unknown.

♂. *Length* (with mandibles), 15–18 mm. ; (without mandibles) 12·5–14 mm. : *breadth*, 5·5–6 mm.

Burma : Hpemaw, Myitkyina (*Po Yone*, Nov.). S.W. China : Yunnan, West of the Mekong River.

Type in the British Museum.

The figure accompanying the original description of this species gives a rather inaccurate representation of it. It is a cylindrical insect, with a very short thorax and parallel-sided elytra, and very closely resembles *C. atavus*, the only obvious difference being in the deeply grooved elytra, with well-punctured convex intervals. The sides of the head behind the eyes

are still more coarsely and deeply wrinkled than those of *C. atavus*, and the depression in front extends rather farther back than in that species.

I have seen only a single example from Burma and the original type from Yunnan. The type specimen is a small example, and many of the features regarded as distinctive of the species by Nagel are individual only.

Subfamily PENICHROLUCANINÆ.

This subfamily is constituted for the very curious genus *Penichrolucanus*, which contains only five known species. It is sufficiently characterized by the form of the tarsi, the joints of which are completely and solidly united, those of the four posterior legs having lost all trace of their original articulations. The claws are reduced to rudiments.

These insects are extremely rare. Only a single specimen has yet been found within the Indian region, and four of the five known species are at present represented only by single specimens. Of the fifth, found in Guadalcanal, Solomon Is., by Capt. R. J. A. Lever, three were taken from rotten wood.

Deyrolle's original description and figure are not entirely accurate, especially as to the form of the antenna.

Genus **PENICHROLUCANUS.**

Penichrolucanus Deyr., Ann. Soc. Ent. France, 1863, p. 485; Parry, Trans. Ent. Soc. Lond. 1864, p. 64; Arrow, Trans. R. Ent. Soc. Lond. lxxxiii, 1935, p. 122; Ann. Mag. Nat. Hist. (11) 2, 1938, p. 62.

TYPE, *P. copricephalus* Deyr. (Malay Peninsula).

Range. Nicobar Is., Malay Peninsula, Sumatra, Solomon Is.

Very small, oblong, compact and rather depressed. Legs short, with the femora and tibiæ broad and flat, and the tarsi solid, very short and thick, the front tarsi with five visible but completely fused joints, the middle and hind tarsi without visible sutures. Claws minute, partly or entirely concealed between the terminal plates of the tarsus. Head short, broad and flat, the eyes well developed, completely divided and far from the lateral margins, which are angularly produced behind. Antennæ very short, the scape long, the 2nd joint short, the club 3-jointed, very short and compact, the foot-stalk extremely short, triangular and solid, composed of three to five immovably united joints. Head emarginate in front, the emargination filled by the mandibles, which are very short, acute, bifid and interlocking, not projecting beyond the general line of the head in the position of rest. Mentum broadly transverse, convex beneath, emarginate in front, with the lateral angles rather sharp. Maxillary and labial palpi moderately long and slender.

Submentum with a strong lateral process on each side, forming a recess beneath to receive the scape of the antenna. Prosternum sharply carinate in front, narrow between the front coxæ, broad and rather flat behind them. Metasternum dilated in front of the middle coxæ and sharply carinate on each side, obliquely carinate on each side behind, and hollowed to form a recess for the hind coxa. Front tibia bifid at the extremity, middle and hind tibiæ acutely produced.

No sexual differences have been found in the few specimens which have been examined, and it is probable that the two sexes are alike externally.

138. **Penichrolucanus nicobaricus.**

Penichrolucanus nicobaricus Arrow,* Trans. R. Ent. Soc. Lond. lxxxiii, 1935, p. 123, fig. 4.

Reddish-chestnut colour, very smooth and shining above and beneath, without hairy clothing.

Elongate, oval or oblong in shape, rather parallel-sided, depressed. *Head* very short and broad, very lightly striolate, with two minute tubercles between the eyes, about equally distant from the latter and from each other. Head deeply and rather narrowly emarginate in front, the anterior part nearly vertical, with a sharp, nearly semi-circular carina at the upper edge. Lateral margins curved, without front angles, the hind angles rather sharp. *Pronotum* short, minutely, sparsely and unevenly punctured, with the sides gently curved in front, almost straight behind, the front angles rather obtuse, and the hind angles sharp, almost right angles. *Scutellum* minute, narrow. *Elytra* parallel-sided, semi-circularly rounded behind, deeply striate, the striæ containing rather large close punctures. *Body* beneath smooth, lightly striolate at the sides, the last sternite sparsely punctured. The *legs* are very short and broad, the front tibiæ strongly bifid at the end, with three very minute, irregularly spaced lateral teeth, and the middle and hind tibiæ acutely produced at the end, but without lateral spine. The claws are entirely hidden between the lateral plates of the onychium.

Length, 7·5 mm. ; *breadth*, 3·5 mm.

Nicobar Is.

Type in M. René Oberthür's collection.

The type is unique.

PASSALIDÆ.

Introduction.

This is one of the most sharply defined and peculiar of all the families of beetles. About 500 species are known to occur in the world, none of them found in Europe and most of them

living in the forest regions of the tropics. Superficially resembling rather closely certain TENEBRIONIDÆ, they have structurally no close relationship with any other family. With the LUCANIDÆ, with which, as another Lamellicorn group of generally large-sized insects of similar habits, it is natural to associate them, they have really little in common, as has been already said. The entire absence of any external difference between males and females throughout the PASSALIDÆ is almost as remarkable as the nearly complete absence of visible features common to the two sexes in many LUCANIDÆ.

There is another very marked difference between the two groups. The LUCANIDÆ show astonishing inconstancy of size within the species. It is quite usual for a large example to have several times the bulk and weight of a small specimen of the same kind. This great variability in size is rather characteristic of those insects which feed upon wood, and is probably related to the varying nutritional value of their food. This is not the case with the PASSALIDÆ however, for the size of each species is, on the whole, rather constant. Social insects seem generally to vary little in size, and we can, perhaps, attribute the constancy of the PASSALIDÆ in this respect to the larvæ being provided by their parents with a uniform and regular supply of food.

Another notable feature of the group is the faculty of stridulation, apparently possessed by all its members in both the larval and adult stages, and not in the former only, as in the LUCANIDÆ. That this faculty is of special importance to these insects,seems to be proved by its universality throughout the family, which is quite exceptional, by the profound structural changes which have accompanied its acquisition, and by the striking fact that in many species the power of flight has been sacrificed for the greater efficiency of the stridulatory apparatus, the wings being used for that purpose alone. In the larvæ, by a still more remarkable alteration, the third-pair of legs for the same end have lost every trace of their original form.

Although the members of both the families dealt with in this volume live in a similar environment and are dependent upon similar food, viz., decaying wood, the organs of the mouth differ widely. Except that the mandibles in both are strong and exposed, there is little resemblance. The mouth-organs of the LUCANIDÆ serve chiefly for the absorption of liquid nourishment, those of the PASSALIDÆ are obviously useless for that purpose, and are much more powerful, as required for dealing with solid matter. The maxillæ, which in the LUCANIDÆ form brushes for the absorption of liquids, are here auxiliary masticatory organs, sharp and horny, and the labrum, or upper lip, which has almost vanished in the LUCANIDÆ, is

very large and protruded in the present group. The other organs of the mouth also differ completely, in the two groups.

The antennæ of the PASSALIDÆ are also of less delicate build, and their sensory lamellæ are differently disposed when at rest. Although the terminal leaflets are often more than three in number in PASSALIDÆ, and occasionally more than three in LUCANIDÆ, the usual number in both groups is three. In PASSALIDÆ, however, discontinuity is almost always visible between the 4th and 5th joints, affording some ground for the supposition that six leaflets may have been the primitive number.

The Oriental and Australian PASSALIDÆ have been divided by Dr. Gravely into six subfamilies but, as the first of these, the AULACOCYCLINÆ, is more distinctly separated from the rest than these are from each other, the differential features of the latter, most of which only include a single genus in our region, being very slight, I have considered it sufficient, for the present purpose, to adopt only two primary divisions.

ASYMMETRY.

A remarkable and unusual phenomenon shown by certain Oriental PASSALIDÆ is asymmetry of the head. This is most strongly developed in the common Indian genus *Aceraius*, in which the right mandible is peculiarly attenuated, while two processes from the front margin of the head are much more prominent on the left side than on the right. In a lesser degree, the same peculiarity is found in the genera *Episphenus* and *Pelopides* and certain other Asiatic genera. Very few cases of a similar kind are known in Coleoptera, but in the volume of this series dealing with the EROTYLIDÆ and related families I have called attention to certain striking examples in the family LANGURIIDÆ, the relationship of which to the PASSALIDÆ is extremely remote (see 'Fauna of India', Coleoptera, EROTYLIDÆ, etc., 1925, pp. 165, 166). In the LANGURIIDÆ, as in PASSALIDÆ, the asymmetry is confined to the head, but in the former it is peculiar to the female and appears to be a consequence of the great enlargement of the left mandible. It seems likely that in both groups the employment of the very strong mandibles in dealing with vegetable fibres is in some way facilitated by the distortion of the head. In the PASSALIDÆ the asymmetry is the same in both sexes, and as these beetles are exceptional in the association of the larvæ and parents of both sexes, it seems not improbable that some special feature in the social behaviour of those species in which it occurs may afford the explanation.

In a paper dealing with "The Evolution and Distribution of certain Indo-Australian Passalid Coleoptera". Dr. Gravely has put forward the view that the asymmetry of the mandibles

and front of the head shows "five separate lines of evolution diverging from some symmetrical or almost symmetrical ancestor", and each distinguishing a different group of genera. An accompanying diagram shows one of these lines of descent, the origin of which is traced back to the Ceylonese *Episphenus moorei*, as entirely separated from the other lines, which are traced to an Australian origin. Dr. Gravely regards the widely separated and, as he supposes, ancestral forms inhabiting Ceylon and Australia, as more closely inter-related than the different asymmetrical forms inhabiting the regions which separate them. From this he draws the following conclusion: "In order to explain the geographical separation of the primitive symmetrical and closely related forms found in the two regions, by the more highly specialized and less closely related allies of each, it must be supposed that conditions on either side of "Wallace's line" (*i.e.*, the dividing line between the Malayan and Papuan Regions—G. J. A.) are for some reason peculiarly favourable to the evolution of highly-specialized forms; and that these have migrated outwards, driving before them the less highly specialized, which have rarely survived to the present day except where they have been able to establish themselves behind zoogeographical barriers, that the more recently evolved forms have not yet been able to cross." He regards the asymmetrical forms, that is to say, as possessing greater vigour than their symmetrical fore-runners, but as having failed at both extremities of their geographical range to surmount barriers which proved no obstacle to the latter.

The closely similar character of the asymmetry in every case, consisting in an extension of the same marginal processes of the head on one side, nearly always the left, sometimes accompanied by very slight differences in the mandibles, renders the theory of five independent origins at the least surprising; and the fact that it is admitted that most of the genera figuring in the genealogical chart are not really primitive forms, does not strengthen the case. Dr. Gravely's argument rests entirely upon his assumption that symmetrical forms cannot have been derived from asymmetrical ones, and that, although similarity in asymmetrical forms may be ascribed to convergence, that of the symmetrical forms cannot be explained in the same way.

In Lucanidæ and other beetles asymmetry between the two mandibles is normal, the teeth upon the opposed inner edges not being opposite to one another, and so enabling the edges to come together more closely and to obtain a firmer grip. In many male Lucanidæ the enlargement of the mandibles is accompanied by an exaggeration of the teeth which renders the asymmetry very conspicuous; but at the greatest development of the mandibles, complete symmetry is found—gripping

power is sacrificed, but exact balance is gained. Since it is obvious that the asymmetrical condition is the earlier one, it appears that the assumption that symmetry cannot be produced from asymmetry is unjustified, and that, when the conditions rendering asymmetry advantageous no longer exist, change in the direction of restoration of symmetry may occur. The two male specimens of *Calcodes burmeisteri* represented upon Plate I in this volume, illustrate graphically the occurrence of such a progression in the Lucanidæ. By bringing together long series of specimens, all stages in the progression can be shown, the similarity of the smallest males to the females and the dissimilarity of the largest making it quite clear that the latter are in the most recent stage.

We are as yet quite ignorant of the cause of asymmetry in the Passalidæ, but the conditions which have produced this result seem to have been operative only in a certain part of the Oriental and Papuan Regions, and there is no apparent reason why their disappearance or relaxation should not have led to the gradual reappearance of symmetrical forms. If, as seems to have been the case in the Languriidæ, the asymmetry accompanied a particular adaptation of the mandibles, the Passalid genus *Aceraius*, the only one in which the two mandibles show any considerable difference, may be the only one in which those conditions are still fully operative, and others may exhibit different stages of the return to symmetry and thus be in a later instead of an earlier stage of development. On the other hand, if the resemblance between the Ceylon and Australian genera is not the result of convergence but of actual affinity, other methods of distribution than migration by land may conceivably have been responsible for their wide separation. It is not suggested that Dr. Gravely's hypothesis must be rejected, but the construction of insect genealogies is apt to suggest a degree of actuality which, in the nature of things, they cannot possess. The names of known genera and species must be used to represent unknown and extinct forms, and, unless accepted with every reserve, serious misconceptions may be conveyed.

Structure of the Imago.

In strong contrast with the highly polymorphic Lucanidæ, the members of this group are characterized by a remarkable uniformity in their outward aspect. Two only are known in which a red patch relieves the monotony of their colouring. All the rest are jet black, although the lower surface of the abdomen may be red, and many have a clothing of coarse reddish hair. The red specimens often found are those still in the soft immature state in which they emerged from the pupal skin. In the general shape, structure of the head, legs

and lower surface, there is also remarkable uniformity. They are generally elongate insects, short-legged and parallel-sided. A few, however, have the hind body shorter and less parallel, and this is an indication of atrophied wings and loss of the power of flight. This is the case with one Indian sp., *Macrolinus obesus*. *Pleurarius brachyphyllus* is said by Gravely to be incapable of flight also, although the wings are perfectly developed and the shape of the hind-body has not undergone alteration. The loss of the faculty is no doubt much more recent in this case. In tropical America a considerable number of different species are found of which the wings are reduced to narrow, but rigid strips of membrane, and the whole shape of the insects has become altered in correspondence. The explanation appears to be that in all the PASSALIDÆ the wings have acquired a secondary function, as part of the apparatus for voice production, which is of greater importance than the primary function of flight. There is a consequent tendency for the more important function to be improved by the sacrifice of the less important. No other family of beetles is known in which sound-producing organs are found in both adults and larvæ of every species.

The beetles produce a squeaking noise by rubbing the terminal part of the abdomen against the wings when these are lying folded beneath the elytra and pressed against their inner surface. The third dorsal segment of the abdomen from the end bears upon each side a rounded eminence with a peculiarly roughened and exceedingly hard surface. Each of these bosses coincides with the horny patch which occurs at the part of the front margin of the wing where it folds back when lying at rest, and these horny patches have also a peculiarly roughened surface. The rubbing together of these two hard rough surfaces produces the " voice " of the insect. In those forms in which adaptation to this purpose has gone farthest the wing has become reduced to a narrow strip, reaching only as far as the corresponding boss upon the back of the abdomen, and is hard and rigid. It lies in a depression of the wing-cover, with a slight cavity behind it, which perhaps increases the volume of sound produced, like the space behind the stretched parchment of a drum.

One of the most distinctive features of the group is found in the mode of articulation of the fore- and hind-body. The mesothorax is produced into a tube upon which the prothorax moves freely in any direction, the base of the pronotum not fitting closely to the bases of the elytra. The scutellum does not, as usual, project between the two elytra and is capable of being completely covered by the pronotum. The legs are adapted for digging and furnished with sharp teeth and spines. The coxæ are deeply imbedded, the front tibia armed

with numerous lateral teeth, and its articulation with the femur strengthened at the base by a locking tooth. The tarsi are short, with simple symmetrical claws and short pulvillus. The middle and hind tibiæ are often fringed with stiff hairs externally.

The prosternum is narrow and produced, in front, where it forms a chin-plate beneath the head, and behind, where it is generally visible as a free lobe. The front coxæ are never widely separated, and in the AULACOCYCLINÆ are brought so close together as to be almost in contact, the prosternum being reduced to a knife edge between them. The middle coxæ also are only narrowly separated by the meso- and metasternum, which are produced to sharp points at their junction, and owing to the unusual length of the mesosternum and the loose articulation of the middle femora with the coxæ, the former are capable of being brought forward so as to lie side by side along the middle line of the body. The hind coxæ are long and narrow and exactly transverse, completely separating the metasternum and abdomen. The legs are subject to remarkably little variation. They are short and not very stout, the front tibiæ furnished along the whole length of the outer edge with sharp scraper-teeth, and bearing near the base of the inner edge a strong tooth which fits into a deep pit in the femur, firmly locking them together. As usual, the front tibia bears a single articulated spur near the base of the tarsus, and the four posterior tibiæ have each two terminal spurs. The middle and hind tibiæ usually terminate in two sharp processes and are fringed with hairs, both internally and externally, the fringes of the middle tibia being sometimes very thick and long. The five-jointed tarsi are always short and quite simple and end in a pair of simple and symmetrical claws, with only a minute pulvillus between them.

The antennæ are short and stout, attached immediately in front of the eye and composed of 10 joints. The scape is not long and the following joints are attached at its extremity, so that the articulation does not form an elbow. The nine joints following the scape form three rather well-marked groups of three joints each, the first three small and of simple bead-like shape, the next three larger, but much narrower on the inner than on the outer side of the antenna, rendering possible the rolling up of its terminal part which is so characteristic of the family. The last three joints form the club in most PASSALIDÆ, but in some genera the narrow ends of the three preceding joints are produced into supplementary leaflets, which are always of unequal length and shorter than the last three, with which they do not usually form a uniform series. At an earlier stage, therefore, there were probably only three club-joints, although it remains possible that six existed in a still

more primitive stage. The last joint, although of similar length to the two preceding it, generally presents a much larger sensory surface. The joints forming the club can be spread out or rolled into a sort of ball, with the leaflets brought close together inside. The leaflets are not thin plates but finger-like processes clothed, except at the base, with hair.

The upper surface of the head has invariably a ridge at the inner edge of each eye (the supraorbital ridge) and a median elevation, sometimes produced into a sharp horn projecting forwards. From the central elevation usually extend a ridge to right and left (the parietal ridge) and a pair of diverging frontal ridges, each ending in a frontal tubercle. The supraorbital ridges may be united behind the parietal ridge by another (supraoccipital) ridge, and may be continued to the front margin of the head or a little beyond it. The processes resulting, although usually symmetrical, are not always so, the left one being sometimes longer than the right, as in *Aceraius*. This may also be the case with another (inner) pair of marginal processes, that on the left side being sometimes longer than that on the right.

The eyes are lateral, prominent and fairly large. The organs of the mouth are exposed, very well developed and highly chitinized. The mandibles are large and provided with sharp biting teeth from the tips to the base of the inner surface, a very peculiar feature being a movable tooth, with sharp transverse edge, attached near the base of each mandible. This appears to be always separately articulated, except in a few AULACOCYCLINÆ. The labrum is chitinous and extruded, forming a large flap lying within the hollow formed by the mandibles. Upon the lower surface of the head the labium is greatly developed and assumes a peculiar form. Both ligula and mentum are hard and chitinous, and the labial palpi are broad and compact, the 2nd joint much enlarged. The mentum is very broad and flat, and produced into a wing-like lobe on each side, partly enclosing the ligula and palpi. The maxillæ are long and both inner and outer lobes are produced into sharp horny hooks. The maxillary palpi are slender and mobile.

Key to the Subfamilies of PASSALIDÆ.

Body cylindrical, front coxæ very prominent, not distinctly separated .... *Aulacocyclinæ*, p. 241.
Body more depressed, front coxæ not very prominent, distinctly separated .... *Passalinæ*, p. 246.

Subfamily AULACOCYCLINÆ.

Body cylindrical, not flattened, very smooth, with only very scanty and inconspicuous hair. Head symmetrical, the

clypeus separated by a suture from the front. Antennæ with three-jointed club. Mandibles usually without movable tooth. Maxilla with the inner lobe two-pronged. Labium not broad, the ligula sharply pointed, not enclosed by the mentum, labial palpi not dilated, the last joint long. Front coxæ not embedded, very prominent, contiguous, not separated by the prosternum. Middle tibia armed externally, with one or more sharp spines, not hairy.

Key to the Genera of AULACOCYCLINÆ.

Head flat in front; mandibles without process	*Aulacocyclus* Kaup., p. 242.
Head bearing frontal horn; mandibles with erect frontal process	*Ceracupes* Kaup., p. 244.

Genus **AULACOCYCLUS.**

Aulacocyclus Kaup, Col. Hefte iii, 1868, p. 4; Gravely, Mem. Ind. Mus. iii, 1914, p. 193; Dibb, Stylops, i, 1932, p. 257; Ent. Mon. Mag. lxix, 1933, p. 197.
Tæniocerus Kaup, Berl. Ent. Zeitschr. xv, 1871, suppl., p. 20.

TYPE, *Passalus edentulus* Macl. (Australia).

Range. Southern India, the Indo-Malayan and Papuan Regions, and Australia.

Body narrow, cylindrical, not flattened, very smooth and shining, almost naked, the legs with very scanty hair, the middle tibia armed with a sharp lateral spine. Front margin of head without projections, bordered by a marginal groove, the vertex bearing a median process, sometimes bent and directed forward at its extremity. Pronotum completely margined and bearing a deep longitudinal median groove. Elytra deeply sulcate. Antennal club composed of three lamellæ, the three preceding joints not produced. Mandible without movable tooth and with erect lateral process. Maxilla with the inner lobe composed of two prongs. Labium long, the ligula not enclosed by the lateral lobes on the mentum, trilobed at the end, the middle lobe acutely pointed, the labial palpi not dilated, the terminal joint long.

Those forms, which, like *A. bicuspis*, have not the central process of the head produced and hooked at the end, have been regarded as forming a separate genus, *Tæniocerus*, but Dibb has pointed out that the transition from one form to the other is unbroken. He has regarded the shape of the lateral scar of the pronotum, simple in *Aulacocyclus* and branching in *Tæniocerus*, as a distinctive feature, but this also fails, for the scar is extremely simple in *A. devrollei*, which cannot be excluded from *Tæniocerus*, if that name is to be retained.

Key to the Species of Aulacocyclus.

Head bearing a slender hooked process: lateral scar of the pronotum punctiform *andrewesi* Gravely, p. 243.
Head bearing a short erect process: lateral scar of the pronotum branched ...... *bicuspis* Kaup, p. 243.

139. Aulacocyclus andrewesi.

Aulacocyclus andrewesi Gravely,* Mem. Ind. Mus. iii, 1914, p. 211, pl. 11, fig. 10.

Very narrowly elongate, very slightly flattened above and extremely glossy. The *head* is hollowed above, very smooth and shining, and bears a slender median process directed obliquely backward, hooked and slightly bifurcated at the end. The labrum is rather strongly dilated in front and divided into two rounded lobes. The front margin of the head is gently excised, the ocular canthus is blunt, not angular, and the supraorbital ridge is rounded in front and behind. The *pronotum* is almost unpunctured, deeply sulcate along the middle, broadly margined in front, the margin deeper and wider on each side, where there are a few fine punctures. The front angles are rather blunt, the sides almost straight in front, gently rounded behind. The lateral scars are reduced to a very small rounded pit on each side. The *elytra* are very long, deeply sulcate, with very convex intervals, the sulci containing feebly impressed punctures, those of the dorsal sulci very minute, the lateral ones a little larger. The *metasternum* is smooth, with a few very fine punctures at the sides bearing short hairs. The *abdomen* is very smooth. The three lamellæ composing the club of the antenna are very long.

Length, 23 mm.; *breadth*, 8·5 mm.

S. India: Anaimalai Hills, 3500 to 4000 ft. (*H. L. Andrewes*, June).

Type in the British Museum.

The type is unique. This is a remarkable and isolated species, the nearest allies of which are found in Australia and the Papuan Region.

140. Aulacocyclus bicuspis. (Plate XXIII, fig. 7.)

Aulacocyclus bicuspis Kaup, Col. Hefte iii, 1868, p. 5.
Tæniocerus bicuspis Gravely, Mem. Ind. Mus. iii, 1914, p. 210, pl. 11, fig. 9.

Cylindrical, very convex, moderately elongate. The *head* is very smooth and shining, but with some large deep punctures on each side behind. The labrum is dilated in front and very gently excised at the front margin. The front margin of the head is gently trisinuate, the supraorbital ridges are almost parallel, sharp, sharply angular in front, the median process short, quadrate at the base, broadly longitudinally grooved,

the anterior angles produced vertically as short points. The sides of the ocular canthi are straight and parallel, and the front angles are fairly sharp but not produced. The *pronotum* is a little broader than it is long, completely margined, the punctures confined to the marginal groove and lateral scars, the front marginal groove very deep. The front angles are rather blunt, the sides almost straight in front. The *elytra* are rather short and broad, the striæ very deep and conspicuously punctured, the intervals very convex. The *metasternum* is very smooth, except for a narrow, parallel-sided, finely rugose lateral band, not deeply impressed, and the extreme anterior angles, which also are finely rugose. The two basal abdominal sternites are short and finely rugose, the three last sternites broad and smooth. The lamellæ composing the club of the antenna are not long. The front *tibia* bears an oval patch of long stiff yellow hairs on its upper surface.

Length, 20 to 27 mm.; *breadth*, 7·5 to 10 mm.

BHUTAN. DARJEELING DISTR.: Mangpu (*E. T. Atkinson*). ASSAM: Mishmi Hills, Delei R., 1700 ft. (*Miss M. Steele*, Feb.). BURMA: Nam Tamai Valley, 3000 ft. (*R. Kaulbach*, July); Mali Hka Valley, Kachin Hills, 1000 to 2500 ft. (*F. Kingdon Ward*, Dec.). MALACCA (according to Kaup).

Type in the Darmstadt Museum.

Burmese specimens are larger than those from other regions, but do not appear to differ otherwise.

Genus **CERACUPES**.

Ceracupes Kaup, Berl. Ent. Zeitschr. xv, 1871, suppl., p. 16; Gravely, Mem. Ind. Mus. iii, 1914, p. 192.

TYPE, *Passalus fronticornis* Westw.

Range. N. India, Burma, Siam.

Body long and narrow, very convex, almost devoid of hair above and beneath, the legs with very scanty hair, the middle tibia bearing two or three strong lateral spines. The median process of the head extends to the front margin and is produced obliquely forward and upward as a narrow horn, grooved above and bifurcated or blunt at the end. The front angles of the pronotum are produced into short rounded lobes, and the front margin has a deep sulcus on each side, the two sulci not meeting as in *Aulacocyclus*. There is also a deep median sulcus. The antennal club is composed of three long lamellæ and the three preceding joints bear very short supplementary lobes. The mandible is without a movable tooth, the tip is acutely tridentate, and the outer edge is provided with a narrow rod-like process directed obliquely forward and upward in correspondence with the cephalic horn. The outer lobe of the maxilla is long and sharp, the inner lobe has two prongs.

the outer one cleft at the tip. The ligula is prominent, trilobed at the end, the middle lobe acutely pointed, the labial palpi not dilated, the terminal joint long.

141. **Ceracupes fronticornis.** (Plate XXIII, figs. 5, 6.)

Passalus fronticornis Westw.,* Ann. Mag. Nat. Hist. viii, 1842, p. 124.
Ceracupes fronticornis Gravely, Mem. Ind. Mus. iii, 1914, p. 277, pl. 11, fig. 12.

Cylindical, very smooth and shining. The *head* is smooth, the median horn abruptly elevated at the vertex, compressed, produced forward and upward, rugose and feebly grooved on the posterior surface, transversely wrinkled on the anterior face, dilated a little towards the end and forked. Canthus produced laterally and more or less pointed, and the supra-orbital ridge produced to a point in front. The erect mandibular process is as long as the frontal horn, triangular in section, and very bluntly pointed. The *pronotum* is a little shorter than its width and very smooth, without punctures except in the deep marginal grooves and the oblique lateral scar. The *elytra* are very deeply sulcate, with conspicuous punctures in the grooves and the intervals strongly convex. The *metasternum* is very smooth, but the anterior angles are evenly punctured and there is a narrow rugose lateral band.

Length, 22 to 30 mm.; *breadth*, 8 to 10 mm.

UNITED PROVS.: Almora, Bajwar (*J. C. M. Gardner*, June). DARJEELING DISTR. ASSAM: Lohit Valley, 1000 to 3000 ft. (*F. Kingdon-Ward* and *R. J. Kaulback*, Mar.). BURMA: Sen Bin Ti, N.E. Burma (*Dr. Murray Stuart*, Feb.); Sin Lum, Bhamo, 6000 ft. (*T. Selkirk*); Ruby Mines (*W. Doherty*). SIAM. TONKIN.

Type in the Hope Dept., Oxford University Museum.

Although the following form is usually distinguished easily by the narrow uncleft frontal horn, certain specimens from Assam seem to form a complete transition, and I therefore regard it as a variety of *C. fronticornis*.

142. **Ceracupes fronticornis,** var. **austeni.**

Ceracupes austeni Stoliczka, Journ. Asiat. Soc. Bengal, xlii, 2, 1873, p. 151; Gravely, Mem. Ind. Mus. iii, 1914, p. 212, pl. 11, fig. 11.

This variety is like the typical form, but the cephalic horn is narrow, tapering anteriorly and bluntly pointed at the end instead of being bifurcated. The *pronotum*, in addition to the punctures in the marginal grooves and lateral scars, has a few scattered punctures on each side near the scars, and the punctures in the elytral grooves are generally a little larger than those of typical specimens.

Length, 21 to 27 mm.; *breadth*, 7·5 to 9 mm.

ASSAM : Mawphlong, Khasi Hills (*Gopi Ram*, April) ; Naga Hills (*O. C. Ollenbach*, April) ; Manipur (*W. Doherty*) ; Mishmi Hills, 4840 ft. (*Miss M. Steele*, Dec.). BURMA : Adung Valley, 6000 ft. (*Lord Cranbrook*, June) ; Ruby Mines (*W. Doherty*) ; Kambaiti, 7000 ft. (*R. Malaise*) ; Dikrang, Dafla Hills (*E. T. Atkinson*).

Type in the Indian Museum, Calcutta.

Subfamily PASSALINÆ.

Body generally more or less depressed or flattened, the sides and the middle and hind tibiæ sometimes thickly clothed with coarse hair. Front coxæ not very prominent, distinctly separated by the prosternum. Club of the antenna generally composed of three long and three short lamellæ. Head without distinct clypeus, the front margin bearing two or four marginal processes, often asymmetrical. Mandibles with movable tooth. Labium broad, the ligula enclosed by the lateral lobes of the mentum, the labial palpi with the 2nd joint dilated and the terminal joint usually reduced.

Key to the Genera of PASSALINÆ.

1	(4)	Antennal club 3-jointed.	
2	(3)	Lamellæ of the antennal club long	*Leptaulax* Kaup, p. 246.
3	(2)	Lamellæ of the antennal club short	*Pleurarius* Kaup, p. 250.
4	(1)	Antennal club composed of six joints.	
5	(12)	Supraorbital ridges of the head united behind.	
6	(9)	Inner lobe of the maxilla double.	
7	(8)	Base of the mentum with lateral grooves..................	*Pelopides* Kuw., p. 252.
8	(7)	Base of the mentum without lateral grooves	*Tiberioides* Grvl., p. 253.
9	(6)	Inner lobe of the maxilla single.	
10	(11)	Pronotum without bristles at sides	*Episphenus* Kaup, p. 255.
11	(10)	Pronotum with bristles at sides. .	*Aceraius* Kaup, p. 259.
12	(5)	Supraorbital ridges of the head not united behind	*Macrolinus* Kaup, p. 263.

Genus LEPTAULAX.

Leptaulax Kaup, Col. Hefte iii, 1868, p. 11 ; Gravely, Mem. Ind. Mus. iii, 1914, p. 302 ; *op. cit.* vii, 1918, p. 112.

TYPE, *Passalus dentatus* F.

Range. The Indo-Malayan and Papuan Regions.

Body flattened, almost devoid of hair except upon the legs and antennæ ; the middle and hind tibiæ with only scanty and inconspicuous fringes. Club of the antenna composed of three

long lamellæ only. Head symmetrical, the front margin bearing four straight, narrow teeth. Pronotum with strong complete median groove and sharp or rather sharp front angles. Elytra long and wings fully developed. Metasternum with the primary lateral depression very narrow, and a secondary and much broader lateral depressed area very sharply defined on each side of the smooth median area. Mandible with a sharp tooth at the outer edge. Maxilla with the outer lobe not very slender and the inner lobe short and simple. Mentum rather short, the basal part relatively long with very deep lateral scars; the ligula short and bluntly pointed at the extremity; the labial palpi with the terminal joint well developed and the preceding joint not much dilated.

The species of this genus, all of which are rather flat, are found, together with their larvæ and pupæ, just beneath the bark of decaying logs. They seem to penetrate less deeply than other PASSALIDÆ into the substance of the wood.

Key to the Species.

1	(4) Sides of the elytra with scalariform puncturation.	
2	(3) Metasternum without irregular puncturation on the median area	*dentatus* F., p. 247.
3	(2) Metasternum irregularly punctured on the median area ...	*cyclotænius* Kuw., p. 248.
4	(1) Lateral grooves of the elytra simply punctured.	
5	(8) Abdomen not entirely punctured.	
6	(7) Marginal grooves of the pronotum coarse	*bicolor* F., p. 249.
7	(6) Marginal grooves of the pronotum fine	*rœpstorffi* Kuw., p. 249.
8	(5 Abdomen entirely and coarsely punctured	*planus* Ill., p. 250.

143. **Leptaulax dentatus.** (Plate XXIII, fig. 8.)

Passalus dentatus F., Ent. Syst. i, 2, 1792, p. 241.
Leptaulax dentatus Gravely, Mem. Ind. Mus. iii, 1914, p. 252, pl. 13, fig. 52; *op. cit.* vii, 1918, p. 116.

Very shining, rather flat. The *head* bears large scattered annular punctures, the front margin bears four equal and nearly equidistant teeth in a straight line and a smaller one in the middle, the median area is narrow and bisected by a strong ridge, the supraorbital ridge is strongly elevated but scarcely toothed and not connected with the parietal ridge. The *pronotum* is strongly transverse, its front angles are rather blunt, the hind angles narrowly rounded, the sides closely and rugosely punctured behind and more sparingly in front. The dorsal striæ of the *elytra* are very minutely punctured, the intervals flat and the sculpture of the sides is scalariform.

The secondary lateral depression on each side of the *metasternum* is closely and rugosely punctured, the middle area smooth and unpunctured, sometimes with a single pair of punctures behind the middle. The ventral *sternites* are smooth, but each has a very finely and densely rugose area at the side.

Length, 25 to 33 mm. ; *breadth*, 8 to 12 mm.

DARJEELING DISTR. : Pedong (*A. Desgodins*). BENGAL : Bagdogra Range, Kurseong (*C. F. C. Beeson*, July). ASSAM : Naga Hills (*W. Doherty*) ; Mishmi Hills (*Miss M. Steele*). BURMA : Ruby Mines (*W. Doherty*) ; Mergui (*R. N. Parker*, Jan.). TENASSERIM : Papun (*Col. Adamson*) ; Mt. Mooleyit, 1800 to 3600 ft. (*L. Fea*, Mar.). ANDAMAN IS. : (*Rœpstorff*, *Capt. Wimberley*). TONKIN. SIAM. MALAY PENINSULA. BORNEO. JAVA. PHILIPPINE IS. CELEBES. NEW GUINEA, etc.

Type unknown.

This is an extremely abundant and widely distributed insect.

144. Leptaulax cyclotænius.

Leptaulax cyclotænius Kuw., Deutsche Ent. Zeits. 1891, p. 188 ; Gravely, Mem. Ind. Mus. iii, 1914, pp. 255, 305, pl. 13, fig. 53 ; *op. cit.* vii, 1918, p. 116.

Very shining, not very elongate, slightly convex. The *head* is strongly punctured, its front edge bears five equidistant teeth, the middle one short, the four outer ones long, nearly equal and almost level ; the median area is not very strongly transverse ; the supraorbital elevations are toothed in front, short and usually not connected with the parietal ridge. The *pronotum* is strongly transverse ; the sides converge a little to the front ; the front angles are rather sharp, the hind angles rather broadly rounded, and the sides are strongly and sometimes very closely punctured. The *elytra* are not very flat, they are very deeply grooved dorsally, the grooves being very finely punctured and the intervals convex. The sides of the elytra have a scalariform sculpture. The middle area of the *metasternum* is distinctly punctured, sometimes upon the greater part of its surface, sometimes with seattered punctures only, and the secondary lateral depressions are sometimes rather closely and sometimes scantily punctured. The ventral *sternites* have large or small finely punctured area on each side, and the terminal one is sometimes entirely punctured.

Length, 14 to 20 mm. ; *breadth*, 5·5 to 7 mm.

ASSAM : Patkai Hills (*W. Doherty*). BURMA : Sin Lum, Bhamo, 6000 ft. (*T. Selkirk*) ; Mali Hka Valley, Kachin Hills, 1000 to 2500 ft. (*F. Kingdon Ward*, Dec.). TONKIN. MALAY PENINSULA. SUMATRA. BORNEO. CELEBES.

Type in M. Réne Oberthür's collection.

145. **Leptaulax bicolor.** (Plate XXIII, fig. 10.)

Passalus bicolor F., Syst. Eleuth. ii, 1801, p. 256.
Leptaulax bicolor Gravely, Mem. Ind. Mus. iii, 1914, pp. 257, 307, pl. 13, fig. 56; *op. cit.* vii, 1918, p. 114.

The abdomen, and sometimes most of the lower surface, is rusty-red. Very flat and shining. The front margin of the *head* bears five equidistant teeth, the second and fourth much longer and more prominent than the rest. The median area is broad and almost semicircular. The parietal ridge is wide and connected with the supraorbital ridges, which are broad behind and bluntly toothed in front. The *pronotum* is strongly and closely punctured at the sides, the lateral margins converge towards the front, the lateral groove is strong, the front angles are acute and the hind angles broadly rounded. The dorsal striæ of the *elytra* are finely punctured, the intervals flat, the lateral grooves strongly punctured, not scalariform. The secondary lateral depression on each side of the metasternum is very coarsely, not densely, punctured and the middle area is smooth. The ventral *sternites* have each a triangular, finely rugose area on each side, and the last is sometimes entirely rugose.

Length, 13 to 25 mm.; *breadth*, 5·5 to 9 mm.

BENGAL: Bagdogra Range, Kurseong (*N. C. Chatterjee*, June). ASSAM: Lakhimpur, Upper Dihing (*C. F. C. Beeson*, June). BURMA: Mergui (*R. N. Parker*); Kambaiti, N.E. Burma, 7000 ft. (*R. Malaise*); Mali Hka, Kachin Hills, 1000 to 2500 ft. (*F. Kingdon Ward*, Dec.). NICOBAR IS.: (*Rœpstorff*, *G. Rogers*). MADRAS: Palghat (*J. C. M. Gardner*, May). SIAM. TONKIN. HAINAN. MALAY PENINSULA. SUMATRA. BORNEO. JAVA. PHILIPPINE IS. CELEBES. GILOLO. NEW GUINEA, etc.

Type in the Copenhagen Museum.

46. **Leptaulax rœpstorffi.** (Plate XXIII, fig. 9.)

Leptaulax rœpstorffi Kuw., Nov. Zool. v, 1898, p. 288; Gravely, Mem. Ind. Mus. iii, 1914, p. 260, pl. 13, fig. 57.

Extremely flat and very shining. The front margin of the *head* bears four equal and almost level teeth, the two inner ones widely separated, with a minute one between them; the median area is broad, the supraorbital ridges are toothed in front, broad behind and united with the parietal ridge, which has a well-marked median tubercle. The *pronotum* is rather quadrate, the front angles are rather sharp, the hind angles not broadly rounded, the lateral edges rather straight, finely margined, the sides very sparsely punctured, but with rather more numerous punctures near the front angles and a deep pit beyond the middle. The dorsal striæ of the *elytra*

are scarcely visibly punctured, the intervals flat, the lateral grooves strongly punctured. The *metasternum* is smooth and shining in the middle, and the secondary depressed area on each side is generally a little roughened and dull, but not punctured. The ventral *sternites* are finely punctured at the sides and base.

Length, 16 to 19 mm. ; *breadth*, 6 to 7 mm.

ASSAM : Abor country (*S. W. Kemp*). BURMA : Tenasserim (*E. T. Atkinson*). ANDAMAN IS. : (*Ræpstorff, Capt. Wimberley*).

Type in M. René Oberthür's collection.

This species is stated by Dr. Kemp to be found in deep fissures in Jack-fruit logs.

147. **Leptaulax planus.** (Plate XXIII, fig. 11.)

Passalus planus Ill., Wiedeman's Arch. Zool. i, 1800, p. 104.
Leptaulax planus Gravely, Mem. Ind. Mus. iii, 1914, pp. 260, 310, pl. 13, fig. 58.

Black and very shining above, with the lower surface, except that of head and prothorax, usually rusty-red. The upper surface is extremely flat. The front margin of the *head* bears five teeth, the middle one very short, the remainder almost equal and level, the two on each side rather close together. The median area is broad, the supraorbital ridges are toothed in front and united behind with the parietal ridge. The *pronotum* is rather quadrate, not very transverse, the sides bear numerous, sometimes very numerous, strong punctures, the front angles are acute and the hind angles not very broadly rounded. The *elytra* are very deeply grooved dorsally, the grooves scarcely visibly punctured, the intervals not very flat, and the lateral grooves are simply punctured. The *metasternum* is slightly rugose in the middle, sometimes with a few scattered punctures, and the secondary depressed lateral areas are coarsely and rugosely, but not very deeply, punctured. The *abdomen* is finely and rather closely, but not deeply, punctured beneath.

Length, 11 to 15 mm. ; *breadth*, 4 to 5·5 mm.

TENASSERIM : Tavoy (according to *Gravely*). SIAM. CAMBODIA. MALAY PENINSULA. SUMATRA. BORNEO.

Type in the Berlin Zoological Museum.

Genus **PLEURARIUS.**

Pleurarius Kaup, Col. Hefte iv, 1868, p. 1 ; Berl. Ent. Zeits. xv, suppl., 1871, p. 27 ; Gravely. Mem. Ind. Mus. iii, 1914, p. 320.

TYPE, *P. pilipes* Kaup (? *brachyphyllus* Stol.).

Range. Southern India.

Body entirely smooth and hairless above, the sides of pro-, meso- and metasternum very closely clothed with hair, and the middle tibia bearing very thick long hair above. Antennal club composed of three short lamellæ only. Head symmetrical, the front margin bearing two obtuse outer and two rather acute inner processes, the margin curvilinear between the latter and defined by a well-marked groove. Supraorbital ridges acutely produced in front and united behind. Mesosternum without distinct lateral scars. Lateral depressed areas of the metasternum very broad but not sharply defined. Mentum entirely punctured, the base narrow; ligula with sharp median carina, the front margin sharply pointed in the middle; the labial palpus with rather long terminal joint. Maxilla with the inner lobe double, the branches very long and slender.

148. **Pleurarius brachyphyllus.** (Plate XXIII, fig. 15.)

Pleurarius brachyphyllus Stoliczka, Journ. Asiat. Soc. Bengal, vol. xlii (2), 1873, p. 152; Gravely, Mem. Ind. Mus. iii, 1914, p. 213, pl. 11, fig. 13.

Elongate, rather convex, entirely smooth and hairless above. On the *head* the supraorbital ridges are very sharply spined above, the frontal ridges strongly rounded, ending in strong tubercles placed just behind the inner marginal processes. The *pronotum* is extremely smooth, with median groove, which reaches the basal margin but is abbreviated in front, the fine marginal groove not dilated at the sides of the front margin. The *elytra* are deeply sulcate, with rounded intervals, and both dorsal and lateral grooves very minutely punctured. The sides of the *mesosternum* are very finely and closely clothed with hair. The sides of the *metasternum* are very broadly densely punctured, the punctured area extending beyond the lateral depression and clothed with long thick hair.

Length, 39 mm.; *breadth*, 14 mm.

S. India: Anaimalai Hills (*T. Davenport*); Camp Valparai, Coimbatore, 3500 ft.

Type in the Indian Museum, Calcutta.

According to Gravely (Rec. Ind. Mus. xi, 1915, p. 496), *Pleurarius brachyphyllus* is abundant in the evergreen jungles on the lower western slopes of the Western Ghats in Cochin. Occasionally, isolated pairs were found in a log, but usually numbers were found together. It makes galleries well below the surface of the burrows in somewhat hard wood and is very difficult to dig out.

Genus **PELOPIDES.**

Pelopides Kuw., Nov. Zool. iii, 1896, p. 229 ; Gravely, Mem. Ind. Mus. vii, 1918, pp. 76, 79, 93.
Eriocnemis Kaup, Col. Hefte iii, 1868, p. 21.

TYPE, *P. gravidus* Kuw.

Range. The Indo-Malayan Region.

Body elongate, convex, and very smooth and hairless above. Middle tibia densely clothed with long reddish hair above. Antennal club composed of three rather short terminal lamellæ and three very short supplementary ones. Head symmetrical, the supraorbital ridges united behind by the posterior ridge, but not produced in front ; the two front marginal processes short, broad and toothed. Supraoccipital ridge short, not sharp. Pronotum without distinct median groove. Maxilla with the lobes long and slender, the inner one double. Mentum with the base broad and deeply grooved on each side ; ligula broad, sharply pointed in front ; labial palpi dilated, the terminal joint not very small.

149. **Pelopides dorsalis.**

Eriocnemis dorsalis Kaup, Berl. Ent. Zeitschr. xv, 1871, suppl., p. 41.
Trapezochilus dorsalis Gravely, Mem. Ind. Mus. iii, 1914, p. 247, pl. 13, fig. 48.
Phraortes nobilis Kuw., Nov. Zool. v, 1898, p. 320.
Trapezochilus nobilis Gravely, Mem. Ind. Mus. iii, 1914, p. 247.

Body convex and very smooth above. Front margin of the *head* with broad, three-pointed process on each side, the outermost point at a lower level than the others. Supraorbital ridges rounded above, not sharp in front. Supraoccipital ridge short, the median elevation pear-shaped, the frontal ridges bisinuate, forming a very acute-angled frontal area. The *pronotum* is very smooth, without median groove, very narrowly margined, the margin not dilated at the ends in front and almost complete at the base. The lateral scar is rather shortly linear. The *mesonotum* has a finely rugose and setose area on each side. The *elytra* are deeply striate, the dorsal intervals slightly convex, the innermost striæ not perceptibly punctured, the lateral striæ finely but very distinctly punctured and the intervals very convex. The sides of the *mentum* are coarsely punctured, the median area of the base smooth, but not shining. The lateral scars of the *mesosternum* are finely punctured and setose, and the metasternum has a broad densely punctured lateral depression on each side.

Length, 36 to 43 mm ; *breadth*, 13 to 15 mm.

TENASSERIM : Tavoy. MALAY PENINSULA. SUMATRA. JAVA.

Type in the Darmstadt Museum.

Genus TIBERIOIDES.

Tiberiodes Gravely, Journ. Asiat. Soc. Bengal (2), viii, 1913, p. 405; Mem. Ind. Mus. iii, 1914, pp. 215, 317; *op. cit.* vii, 1918, pp. 78, 84.

TYPE, *Tiberius kuwerti* Arrow.

Range. India and Burma.

Body entirely without hair above, very smooth. Head symmetrical, the front margin with very short outer processes or none, the inner processes broadly triangular. Supraorbital ridges united behind by a supraoccipital ridge. Pronotum without a complete median groove. Club of the antenna composed of three long lamellæ and three supplementary short ones. Middle tibia very thickly clothed with hair above. Maxilla with the inner lobe double. Mentum broad at the base, with the ligula longitudinally ridged and its front margin excised; the labial palpus with the second joint dilated and the terminal joint long and narrow.

Key to the Species.

1	(2)	Sides of the elytra with scalariform sculpture	*kuwerti* Arrow, p. 253.
2	(1)	Sides of the elytra very finely punctured in the lateral grooves.	
3	(4)	Elytra not much dilated behind ...	*austeni* Gravely, p. 254.
4	(3)	Elytra much dilated behind	*borealis* Arrow, p. 254.

150. Tiberioides kuwerti.

Tiberius kuwerti Arrow, Trans. Ent. Soc. Lond. 1906 (1907), p. 446.
Tiberioides kuwerti Gravely, Mem. Ind. Mus. iii, 1914, p. 215, pl. 11, fig. 14.
Aceraius cancrus Kaup, Col. Hefte iii, 1868, p. 29.

Moderately elongate and rather convex, the middle tibia thickly clothed with reddish hair upon the upper face. The antennal club is composed of three long lamellæ preceded by three short ones. The *head* is symmetrical, the supraorbital ridges are rounded above and very slightly and bluntly produced at the front margin, and the inner marginal processes are triangular, broad at the base and acute at the apex. The frontal ridges are short and strongly bisinuate, terminating in front in a pair of strong tubercles not far apart. The *pronotum* is very smooth, without median groove and without punctures, except in, or very near, the small roundish lateral scars. The fine marginal groove is scarcely dilated at the sides of the front margin. The *elytra* are not very long, rounded at the sides, deeply grooved dorsally, the outermost grooves very minutely punctured and the inner ones unpunctured, and the sides are sharply carinate, with the intervals dull and sooty, each with a more or less distinct row of elevated points. The sides of the *mentum* are very coarsely and closely punctured,

the middle of the base very smooth. The lateral scars of the *mesosternum* are small and narrow. The lateral depressed areas of the *metasternum* are broad, finely and densely punctured, and clothed with short hair.

Length, 37 to 43 mm.; *breadth*, 13 to 15 mm.

N. Burma: Mali Hka Valley, Kachin Hills, 1000 to 2500 ft. (*F. Kingdon Ward*, Dec.); Sin Lum, Bhamo, 6000 ft. (*T. Selkirk*). Bhutan (*Capt. Pemberton*). Sikkim: Gantok (June). Darjeeling Distr.: Mangpu (*E. T. Atkinson*). Assam: Kohima, Naga Hills, 5700 ft. (April).

The *type* of the species is the specimen in the Darmstadt Museum described by Kaup under the incorrect name of *Aceraius cancrus*.

151. Tiberioides austeni.

Tiberioides austeni Gravely, Mem. Ind. Mus. iii, 1914, p. 216, pl. 11, fig. 15.

A large species, rather elongate, slightly convex, extremely smooth and shining, the middle tibia very thickly clothed with reddish hair above. The three terminal joints of the antennal club are long, the seventh is rather long, the fifth and sixth short. The *head* is symmetrical, the supraorbital ridges are broadly rounded above and not produced in front, the inner marginal processes are acutely pointed, but very short, broad at the base, the frontal ridges are short and strongly bisinuate, ending in strong tubercles not far apart. The parietal ridge is strong. The *pronotum* is rather strongly transverse, without punctures except in or very near the small lateral scars, the marginal groove fine, not dilated at the sides of the front margin. The *elytra* are deeply grooved, with convex intervals, the dorsal grooves not distinctly punctured and the lateral grooves very minutely. The *mentum* is smooth in the middle and at the sides anteriorly and very coarsely punctured posteriorly. The lateral scars of the *mesosternum* are long, deep and opaque, and the lateral depressed areas of the *metasternum* are densely punctured but not closely hairy.

Length, 45 mm.; *breadth*, 16 mm.

Burma: Mishmi Hills (*Miss M. Steele*). Assam: Abor country, 3800 ft. (*S. W. Kemp*, Dec.).

Type in the Indian Museum, Calcutta.

This species was found by Dr. Kemp deep in a very hard dry log.

152. Tiberioides borealis.

Chilomazus borealis Arrow,* Trans. Ent. Soc. Lond. 1906 (1907), p. 467.

Tiberioides borealis Gravely, Mem. Ind. Mus. iii, 1914, p. 320; *op. cit.* vii, 1918, p. 85.

Very smooth, not very long, the elytra relatively short,

dilating behind. The middle tibia has a long and close brush of reddish hair. The club of the antenna is composed of three moderately long and three short lamellæ. The *head* is slightly rugose, the median elevation is rather blunt, the frontal area short and broad, the frontal tubercles strong, not close together, the marginal processes broadly triangular and sharp pointed. The *pronotum* is relatively rather narrow, very smooth, with a faint trace only of a median groove, the lateral scar small, rather round and containing a few fine punctures. The *elytra* are rather narrow at the shoulders, which are rather sharp, and the sides diverge and are strongly rounded beyond the middle, where the width is much greater than at the shoulders. They are finely and deeply striate both dorsally and laterally, the dorsal striæ not visibly punctured and the lateral striæ only very indistinctly. The *mentum* is closely punctured at the sides and smooth at the base, which bears a sharp arcuate carina from side to side. The lateral scars of the *mesosternum* are rather deep and shining. The sides of the *metasternum* are closely and rather finely and rugosely punctured.

Length, 35 mm. ; *breadth*, 14 mm.

ASSAM : Naga Hills (*W. Doherty*).

Type in the British Museum.

Only the unique type is known. Gravely mentions a " protuberance on the anterior margin (of the mentum) somewhat as in *Episphenus comptoni*." There is in reality only a slight convexity of the surface.

Genus **EPISPHENUS.**

Episphenus Kaup, Berl. Ent. Zeits. xv, 1871, suppl., p. 45; Gravely, Mem. Ind. Mus. iii, 1914, pp. 217, 320 ; *op. cit.* vii, 1918, pp. 78, 85.
Basilianus Kaup, *op. cit.* p. 55.
Laches Kaup, *op. cit.* p. 48.
Chilomazus Zang, Zool. Anz. xxix, 1905, p. 154.

TYPE, *E. moorei* Kaup.

Range. Ceylon, India, Annam.

Upper surface smooth, not much flattened above, the pronotum with a median groove, generally strong and complete, but entirely without hairs or setæ at the sides, the elytra also without hair at sides. Head symmetrical or asymmetrical, the front margin bearing two or four processes. The antennal club composed of six lamellæ, the last three usually, but not always, distinctly longer than the preceding three.

The essential difference between this genus and *Aceraius* is the complete absence in *Episphenus* of the bristles, sometimes few and inconspicuous, to be found at the sides of the pronotum in *Aceraius*. There is always a median thoracic groove, although in *E. comptoni* it is incomplete and rather feeble.

Key to the Species.

1	(4) Marginal processes of the head very asymmetrical.	
2	(3) Outer marginal processes distinctly produced	*indicus* Stol., p. 256.
3	(2) Outer marginal processes scarcely produced	*neelgheriensis* Guér., p. 257.
4	(1) Marginal processes of the head not very asymmetrical.	
5	(8) Inner marginal processes strong and sharp.	
6	(7) Last four joints of the antennal club equal, very long	*comptoni* Kaup, p. 257.
7	(6) Last four joints of the antennal club unequal, shorter	*flachi* Kuw., p. 258.
8	(5) Inner marginal processes feeble	*moorei* Kaup, p. 259.

153. **Episphenus indicus.**

Basilianus indicus Stoliczka, Journ. Asiat. Soc. Bengal xlii, 2, 1873, p. 159.
Episphenus indicus Gravely, Mem. Ind. Mus. iii, 1914, p. 220, pl. 11, fig. 20 ; *op. cit.* vii, 1918, p. 86.

The three terminal joints of the antenna are long and the three preceding them short. The middle tibiæ are very thickly clothed with reddish hair above. The marginal processes of the *head* are very asymmetrical, the outer ones distinctly produced, the left inner process long and bent inwards, the right one short, sharp and triangular ; the frontal area short and strongly transverse. The *pronotum* has a fairly deep median groove and is extremely smooth, without punctures, except, usually, a very few in the short lateral scars. The lateral groove is a little deflected and very deep at the sides of the front margin. The *elytra* are deeply grooved and the grooves very minutely punctured dorsally and laterally. The *mentum* is strongly and closely punctured at the sides and smooth at the base. The lateral scars of the *mesosternum* are deep and opaque. The sides of the *metasternum* bear uneven, sometimes confluent, punctures, with smooth areas interspersed

Length, 29 to 41 mm. ; *breadth*, 10 to 14·5 mm.

S. India : Palni Hills, Kodaikanal, 5000 to 7000 ft. (*S. Kemp*, Aug. ; *L. V. Newton*, June) ; Camp Valparai, Coimbatore, 3500 ft. ; Nilgiri Hills (*H. L. Andrewes*) ; Anaimalai Hills ; N. Kanara (*T. R. D. Bell*) ; Trichinopoly (*J. Castets*).

Type in the Indian Museum, Calcutta.

This is a very variable species both in size and in the degree of production of the outer marginal processes of the head. Specimens in which the processes are short are not easily distinguishable from *E. neelgheriensis*, which is found in the same localities.

154. Episphenus neelgheriensis.

Passalus neelgheriensis Perch., Mag. Zool. xi, 1841, p. 4, pl. 11, fig. 1.
Episphenus neelgheriensis Gravely, Mem. Ind. Mus. iii, 1914, p. 222, pl. 11, fig. 21.

This is the smallest of our five species of *Episphenus*. The three terminal joints of the antenna are long and the three preceding ones not very short. The middle tibia has a rather thick fringe of reddish hairs above. The marginal processes of the *head* are asymmetrical, the outer ones very short and obtuse, the inner ones not far apart, that on the left long and bent inwards, that on the right, short, the frontal area not very transverse. The *pronotum* is without punctures except in and near the lateral scars, which, as well as the median groove, are not strong. The marginal groove is scarcely at all dilated at the sides of the front margin. The dorsal striæ of the *elytra* are scarcely visibly punctured, the lateral striæ minutely. The *mentum* is very coarsely and densely punctured at the sides and smooth in the middle. The lateral scars of the *mesosternum* are large, deep and finely rugose, the lateral depressions of the *metasternum* are narrow, finely rugose and hairy, and the sides of the median area bear not very numerous, irregular, sometimes confluent punctures, with smooth interspersed areas.

Length, 28 to 30 mm. ; *breadth*, 11 mm.

S. India : Nilgiri Hills, Ootacamund, Gudalur (*J. C. Fernandez*, Oct.) ; Anaimalai Hills ; Palni Hills, Kodaikanal, 5500 ft. (*S. Kemp*, Sept.) ; Trichinopoly (*R. P. Castets*).

Type unknown.

155. Episphenus comptoni. (Plate XXIII, fig. 13.)

Aceraius comptoni Kaup, Col. Hefte iii, 1868, p. 28 ; *op. cit.* iv, 1868, p. 3.
Laches comptoni Kaup, Berl. Ent. Zeits. xv, 1871, suppl. p. 49, pl. 4, fig. 5.
Episphenus comptoni Gravely, Mem. Ind. Mus. iii, 1914, pp. 218, 262, pl. 11, fig. 18.

This is the largest of the five species from Ceylon and Southern India comprised in the genus. The club of the antenna consists of four very long and equal lamellæ preceded by two short ones. The middle tibia bears a rather thick but not long fringe of red hairs upon its upper face. The *head* is well punctured, the marginal processes very slightly asymmetrical, the outer ones short, the inner ones rather far apart, sharp, that on the left a little longer than that on the right. The frontal area is very short and broad, the supraorbital ridges are rather sharp, the parietal ridge feeble. The *pronotum* is extremely smooth, the median groove incomplete and rather

feeble, the marginal groove very fine and not dilated in front, the lateral scars very small. The *elytra* are deeply grooved, the dorsal grooves scarcely punctured, the lateral ones very minutely. The *mentum* is very strongly and closely punctured at the sides, and the base has a strong rounded elevation in the middle. The lateral scars of the *mesosternum* are large, deep and opaque. The sides of the *metasternum* are very unevenly, and in part confluently punctured, with interspersed smooth areas.

Length, 38 to 43 mm. ; *breadth*, 14 to 16 mm.

CEYLON : Ohiya, Uva Prov., 5800 ft. (*Gauri Dutt*, Dec.) ; Dikoya, 3800 to 4200 ft. (*G. Lewis*, Feb.).

Type in M. René Oberthür's collection.

Mr. Dutt found this species in *Calophyllum walkeri* and *Somocarpus thwaitesi*.

156. **Episphenus flachi.** (Plate XXIII, fig. 16.)

Laches flachi Kuw., Deutsche Ent. Zeits. 1891, p. 167.
Episphenus comptoni var. *flachi* Gravely, Mem. Ind. Mus. iii, 1914, pp. 219, 282, pl. 11, fig. 19.

Although regarded by Gravely as specifically identical with *E. comptoni*, comparison of considerable series of specimens has compelled me to treat it as distinct. It is markedly smaller, the lamellæ of the antennal club are not quite so long, and the three last are distinctly longer than the preceding one. The middle tibia is less thickly fringed. The *head* is generally rather smooth, with fewer punctures than in *E. comptoni*, the outer processes very short, as in that species, the inner ones far apart, sharply pointed and almost alike. The frontal area is very short and transverse, the supraorbital ridges are fairly sharp, the parietal ridge feeble. The *pronotum* is extremely smooth, without punctures, except in the short lateral scars, the median groove is well marked and the marginal groove is very fine and not dilated at the sides of the front margin. The sides of the *mentum* are strongly and closely punctured and the base bears a rounded elevation in the middle. The lateral scars of the *mesosternum* are deep and opaque. The sides of the *metasternum* are closely and rugosely punctured.

Length, 32 to 36 mm. ; *breadth*, 11·5 to 12·5 mm.

CEYLON : Dikoya, 3800 to 4200 ft. (*G. Lewis*, Feb.) ; Pattipola, Uva Prov., 6200 ft. (*G. Dutt*, Dec.) ; Hatton Forest, 4500 ft. (*G. B. Longstaff*, Mar.).

Type in M. René Oberthür's collection.

Specimens have been found in *Rhododendron arboreum* trunks.

Although it is possible that this is a small variety of *E. comptoni*, as supposed by Gravely, it is certainly a well-marked form with rather numerous points of difference, and I can

find no sufficient reason, at present, for treating them as conspecific. Gravely has mentioned a specimen of intermediate length (37 mm.), but has not stated that it is intermediate also in the form of the antennal club, the puncturing of the head, the median groove of the pronotum, etc.

157. Episphenus moorei.

Episphenus moorei Kaup, Berl. Ent. Zeits. xv, 1871, suppl. p. 45 ; Gravely, Mem. Ind. Mus. iii, 1914, p. 217, pl. 11, fig. 16.
E. pearsoni Gravely, *op. cit.* pp. 218, 281, pl. 11, fig. 17.

Convex, not very elongate, the middle tibia bearing only a very thin fringe of hairs above. The club of the antenna consists of three moderately long joints preceded by three very short ones. The marginal processes of the head are symmetrical and very short, the outer ones sharply angular but not produced, the inner one far apart, sharp, but very short. The frontal ridges, extending from the median elevation to the inner marginal processes, are rather straight and enclose a nearly equilateral triangle. The supraorbital ridges are sharp and the parietal ridge strong. The *pronotum* has a few scattered punctures on each side, the median groove is deep and the lateral scars rather large and deep. The marginal groove is a little dilated at the sides of the front margin. The *elytra* are deeply grooved, the dorsal grooves finely but distinctly, the lateral grooves fairly strongly punctured. The lateral scars of the *mesosternum* are deep, broad, and close together anteriorly. The lateral depressions of the *metasternum* are broad and densely punctured and the sides of the median area irregularly rugose.

Length, 30 to 33 mm. ; *breadth*, 11 to 12 mm.

CEYLON : Madulsima, Uva Prov. (*T. Bainbrigge Fletcher*, May, Dec.) ; Pattipola, Uva Prov., 6200 ft. (*Gauri Dutt*, Dec.) ; Ratnapura (*Gauri Dutt*).

Type in the Darmstadt Museum.

This species has been found in trunks of *Manifera zeylanica* and *Rhododendron arboreum*.

Genus **ACERAIUS.**

Aceraius Kaup, Col. Hefte iii, 1868, p. 26 ; Gravely, Mem. Ind. Mus. iii, 1914, pp. 286, 318 ; *op. cit.* vii, 1918, p. 79.
Ophrygonius Zang, Zool. Anz. xvii, 1904, p. 697.

TYPE, *Passalus grandis* Burm.

Range. The Indo-Malayan Region.

Body stout, moderately elongate, not much flattened above, with reddish hair or setæ upon the head, sides of the pronotum and generally upon the sides of the elytra, the middle tibiæ with dense hair upon the upper surface. Antennal club composed

of three long terminal lamellæ and three shorter supplementary ones. Head asymmetrical, the supraorbital ridges sharply elevated, united behind by a continuous curved ridge and sometimes produced into outer marginal processes in front; the inner marginal processes very unequal, the left one long and oblique. Parietal ridge strong and sharp. Pronotum with incomplete median groove or none. Maxilla with the inner and outer lobes simple, long and slender. Mentum broad; ligula stout, not acuminate, the labial palpi dilated, the last joint small.

I have united *Ophrygonius* and *Aceraius*, which differ only in the degree of hairiness of the sides of the elytra. No sharp dividing line can be drawn in this respect.

Key to the Species.

1	(4)	Sides of the elytra thickly clothed with hair.	
2	(3)	Head bearing four marginal processes	*grandis* Burm., p. 260.
3	(2)	Head without outer marginal processes	*helferi* Kuw., p. 261.
4	(1)	Sides of the elytra without thick hair.	
5	(6)	Lamellæ of the antennal club short	*cantori* Perch., p. 262.
6	(5)	Lamellæ of the antennal club long	*birmanicus* Grvl., p. 263.

158. **Aceraius grandis.** (Plate XXIII, fig. 17.)

Passalus grandis Burm., Handb. Ent. v, 1847, p. 463.
Aceraius grandis Gravely, Mem. Ind. Mus. iii, 1914, p. 231; *op. cit.* vii, 1918, p. 92.

Very large and stout, with the sides of the elytra and metasternum and the upper surface of the middle tibia thickly clothed with hair. The *head* is closely punctured, the punctures bearing short erect setæ. The supraorbital ridges are sharp and long, being produced as blunt outer marginal processes, the left one long, tapering and directed straight forward or inclined slightly inward, the right one shorter and more or less triangular; the inner marginal processes strong, the left one long, inclined inwards, rather parallel-sided and obliquely truncate at the end, the right one short and broad. The median tubercle is sharp but not strong, and the frontal ridges are widely divergent. The *pronotum* is very smooth, without median groove, but with fairly strong punctures near the lateral margins and the sides of the front margin. The *elytra* are deeply striate, the striæ unpunctured, the three outermost intervals are densely punctured and thickly hairy in their anterior part, and the seventh and ninth intervals are punctured throughout, the former less closely. The sides of

the *metasternum* are broadly and densely punctured and hairy. The *abdomen* is very smooth.

Length, 38 to 50 mm. ; *breadth*, 14 to 19 mm.

Darjeeling Distr. : Mangpu (*E. T. Atkinson*) ; Pedong (*A. Desgodins*). Assam : Patkai Hills (*W. Doherty*) : Mondon, Mishmi Hills (*Miss M. Steele*). Burma : Mali Hka Valley, Kachin Hills, 1000 to 2500 ft. (*F. Kingdon Ward*, Dec.) ; Sin Lum, Bhamo, 6000 ft. (*T. Selkirk*). Tonkin. Malay Peninsula. Sumatra. Borneo. Java. Formosa.

Type in the Halle Museum.

This is a very common species, found in large communities and said to bore in tough wood.

159. **Aceraius helferi.**

Aceraius helferi Kuw., Deutsche Ent. Zeits. 1891, p. 163 Gravely, Mem. Ind. Mus. vii. 1918, p. 89.
A. tavoyanus Gravely, Mem. Ind. Mus. iii, 1914, p. 237.
A. himalayensis Gravely, *op. cit.* p. 236.

Fairly large, with the sides of the elytra and metasternum and the upper surface of the middle tibia thickly clothed with hair. The *head* is strongly punctured, the punctures bearing short erect setæ. The supraorbital ridges are sharp and end anteriorly in minute sharp points, without reaching the front margin. The inner marginal processes are strongly produced, that on the right sharply triangular, that on the left long, parallel-sided, inclined inwards and obliquely truncate at the end. The median elevation is sharp but not strong, and the frontal ridges are not strongly divergent. The *pronotum* is very smooth, without median groove and with only a few scattered punctures at the sides, except in the lateral scars. The *elytra* are deeply striate, the striæ not punctured, the three outermost intervals densely punctured and hairy in their anterior part, the ninth interval is entirely punctured, and the seventh bears scattered punctures. The sides of the *metasternum* are broad and densely punctured and thickly hairy, and the *abdomen* is very smooth.

Length, 33 to 40 mm. ; *breadth*, 12 to 15 mm.

Sikkim : Cheung Tong (*H. J. Walton*). Darjeeling Distr. : Pedong (*A. Desgodins*). Assam : Lohit Valley, Mishmi Hills, 1000 to 3000 ft. (*F. Kingdon Ward* and *R. J. Kaulback*, March). Burma : Ruby Mines (*W. Doherty*) ; Cheba, Karen Hills, 3600 to 4000 ft. (*L. Fea*, Jan.) ; Sin Lum, Bhamo, 6000 ft. (*T. Selkirk*). Tonkin. Siam. Malay Peninsula.

Type in M. René Oberthür's collection ; those of *tavoyanus* and *himalayensis* in the Indian Museum, Calcutta.

160. Aceraius cantori.

Aceraius cantori Perch., Mag. Zool. xiv, 1844, p. 3, pl. 134, fig. 2.
Basilianus cantoris Stoliczka, Journ. Asiat. Soc. Bengal, xlii, 2, 1873, p. 159.
Ophrygonius cantori Gravely, Mem. Ind. Mus. iii, 1914, p. 224, pl. 11, fig. 22.

Body stout, not much depressed, moderately elongate, bearing short erect reddish hairs upon the head and the sides of the pronotum, the middle tibia clothed with long dense hair upon the upper surface. The antennal club consists of three long terminal lamellæ and three short supplementary ones. The head is unsymmetrical. The supraorbital ridges are short but do not extend to the front margin, the median elevation is small, the frontal ridges are divergent and bear strong frontal tubercles, and the inner marginal processes are strong, that on the left long, triangular, bluntly pointed and scarcely inclined, that on the right more shortly triangular and rather sharp-pointed. The *pronotum* is rather short, very smooth, with not more than a trace of a median groove. There are fairly numerous fine setigerous punctures close to the lateral edge, especially in and around the lateral scar. The lateral groove is very fine, as well as its extension at the side of the front margin. The *elytra* are deeply grooved, the grooves not visibly punctured. The *mentum* is closely punctured at the sides and smooth in the middle of the base. The *mesosternum* is without distinct lateral scars and the *metasternum* is only very lightly punctured at the sides.

Length, 27 to 36 mm. ; *breadth*, 10 to 13 mm.

PUNJAB : Kulu. UNITED PROVS. : Kumaon, W. Almora (*H. G. Champion*). BHUTAN : (*Capt. Pemberton*). ASSAM : Kohima, Naga Hills, 5700 ft. (April) ; Delai Valley, Mishmi Hills, 5300 ft. (*Miss M. Steele*, Nov.). TENASSERIM (*E. T. Atkinson*).

Type unknown.

161. Aceraius cantori, var. convexifrons.

Basilianus cantori subsp. *convexifrons* Zang, Zool. Anz. xxvii, 1904, p. 698.
Ophrygonius cantori subsp. *convexifrons* Gravely, Mem. Ind. Mus. iii, 1914, p. 225.
O. cantori subsp. *dunsiriensis* Gravely, *l. c.* pl. 11, fig. 23 ; *op. cit.* vii, 1918, p. 87.

ASSAM : Manipur (*W. Doherty*). BURMA : Ruby Mines (*W. Doherty*) ; Sin Lum, Bhamo, 6000 ft. (*T. Selkirk*) ; Adung Valley, 2000 ft. (*F. Kingdon Ward*, May).

Burmese representatives of the species are a little smaller than those from the Himalayas, but in Assam the size is variable. The name *dunsiriensis* was given to certain specimens from Assam in which the mentum has a basal ridge extending

from side to side, but the author later abandoned this name as a synonym of *convexifrons*.

162. Aceraius birmanicus.

Ophrygonius birmanicus Gravely,* Mem. Ind. Mus. iii, 1914, p. 226, fig. 3 *a*, pp. 285, 320.

The six lamellæ composing the antennal club are exceptionally long, and the difference between the seventh joint and those which precede it is small. The *head* is strongly but not very closely punctured, and the frontal area is broad. The left inner marginal process of the head is slender and inclined strongly to the right. The *pronotum* has a vestige of a median groove in the basal half and the lateral margins are fairly closely and finely punctured, the punctures bearing erect setæ. The *mesosternal* scars are deep and opaque, the sides of the *metasternum* very broadly and densely punctured and clothed with hair.

Length, 35 to 37 mm.; *breadth*, 13 mm.

BURMA: Ruby Mines (*W. Doherty*); Kambaiti, N.E. Burma, 7000 ft. (*R. Malaise*, March to May). MALAY PENINSULA: Perak.

Type in the British Museum.

Genus MACROLINUS.

Macrolinus Kaup, Col. Hefte iii, 1868, p. 18; Gravely, Mem. Ind. Mus. iii, 1914, p. 323; *op. cit.* vii, 1918, p. 80.

TYPE, *Passalus latipennis* Perch.

Range. Ceylon; Indo-Malayan Region; Celebes.

Form very various, convex or more or less flattened, elongate and winged or short and wingless. The club of the antenna consisting of three terminal lamellæ and three supplementary ones, generally short, but sometimes long. The head symmetrical, the front margin bearing two sharp triangular processes, the supraorbital ridges short, ending abruptly behind and not united by a posterior ridge. The middle tibia bears scanty hairs or fringes of close but not long hairs.

The genus is easily recognizable by the absence of a posterior ridge uniting the two supraorbital ridges of the head.

Key to the Species.

1 (14) Elytra long, not very convex.
2 (9) Pronotum without complete median groove.
3 (8) Lateral grooves of the elytra finely punctured.
4 (5) Antenna with six very long lamellæ . . . . *latipennis* Perch., p. 264.
5 (4) Antenna with three long and three short lamellæ.

6	(7)	Frontal area of head short, apical angle acute	*nicobaricus* Gravely, p. 264.
7	(6)	Frontal area of head equilateral, apical angle not acute	*andamanensis* Stol., p. 265.
8	(3)	Sides of the elytra with scalariform puncturation	*sikkimensis* Stol., p. 266.
9	(2)	Pronotum with complete median groove.	
10	(13)	Pronotum punctured at the sides.	
11	(12)	Elytral grooves very strongly punctured	*crenatipennis* Kuw., p. 266.
12	(11)	Elytral grooves not very strongly punctured	*rotundifrons* Kaup, p. 267.
13	(10)	Pronotum unpunctured	*waterhousei* Kaup, p. 267.
14	(1)	Elytra short and very convex . . .	*obesus* Gravely, p. 268.

163. Macrolinus latipennis.

Passalus latipennis Perch., Mag. Zool. xi, 1841, p. 8, pl. 77, fig. 3.
Macrolinus latipennis Kaup, Berl. Ent. Zeits. xv, 1871, suppl. p. 43; Gravely, Mem. Ind. Mus. iii, 1914, pp. 245, 296, pl. 13, figs. 45, 46.

Rather small, elongate and a little depressed, the head and the sides of the body beneath bearing short reddish hairs or setæ. The club of the antenna consists of six long lamellæ, their extremities reaching a uniform level, and the last three not conspicuously longer than the rest. The *head* is closely punctured, the frontal area is nearly equilateral, the frontal tubercles placed close to the front margin and the inner marginal processes acute. The *pronotum* is without marginal groove or has only a slight vestige. The lateral scar is rather large and contains fine setigerous punctures, which are also numerous along the lateral margin and in a roundish patch near the front angle. The *elytral striæ* are very finely punctured and the punctures in the lateral striæ are only a little stronger. The basal part of the *mentum* is smooth in the middle. The mesosternal scars are long and rough, the intervening area more or less opaque, sometimes with a median keel. The median area of the *metasternum* has finely and scantily punctured hind angles. The middle *tibiæ* bear short and not very close fringes.

Length, 25 to 27 mm.; *breadth*, 9·5 mm.

BURMA: (according to *Gravely*). MALAY PENINSULA. BORNEO. JAVA.

Type unknown.

164 Macrolinus nicobaricus.

Macrolinus nicobaricus Gravely,* Mem. Ind. Mus. iii, 1914, p. 241, pl. 13, fig. 40.

Elongate and moderately convex. The pronotum very smooth, without median groove. The lateral grooves of the elytra very minutely punctured. The middle tibiæ bearing not very close fringes of short hairs.

This species has a very close relationship with *M. andamanensis*, from which it differs only in a few small details. The club of the antenna is composed of rather shorter lamellæ, the marginal processes of the head are not vertically bifurcated, the frontal ridges end in sharp tubercles and are strongly bisinuate, making the apical angle very acute, so that the frontal area appears shorter and less regularly triangular in shape. The mesosternum has on each side of its base a small roundish area covered with fine close scratches, and the median area of the metasternum is without punctures in the hind angles.

Length, 34 to 35 mm. ; *breadth*, 13 mm.

Nicobar Is. : (*F. A. Ræpstorff*).

Type in the Indian Museum, Calcutta ; *co-type* in the British Museum.

The name *Aceraius nikobaricus* was given by Redtenbacher (Reise der Novara, Zool. ii, 1867, p. 49) to a specimen presumably to be found in the Vienna Museum. The description, according to Dr. Gravely (Mem. Ind. Mus. iii, 1914, p. 291), is made from the anterior half of a specimen of the present species, to which the posterior half of an *Aceraius* has been fixed. The name can therefore be ignored. A good many other puzzling "species" of insects are no doubt to be accounted for by mistakes of the same kind.

165. **Macrolinus andamanensis.** (Plate XXIII, fig. 14.)

Basilianus andamanensis Stol., Journ. Asiat. Soc. Bengal, xlii, 2, 1873, p. 160.
Macrolinus andamanensis Gravely, Mem. Ind. Mus. iii, 1914, p. 242, pl. 13, fig. 41.

Elongate and moderately convex, the pronotum very smooth, without median groove. The club of the antenna consists of three long terminal lamellæ and three shorter preceding ones. The middle tibia is fringed with short, not very dense reddish hairs. The *head* is finely punctured, the median tubercle rather sharp, the supraocular ridges short and broad, the frontal area not very short, the frontal ridges meeting in a slightly obtuse angle and not strongly bisinuate, the marginal processes triangular, rather sharp, bifurcated as seen in profile. The lateral margins of the *pronotum* and the lateral scars are finely and very closely punctured, and the lateral grooves of the *elytra* are very minutely punctured. The median area of the *metasternum* bears only a few very fine punctures in the hind angles.

Length, 35 mm. ; *breadth*, 14 mm.

Andaman Is. : Ponighat, Hopetown (*R. B. S. Sewell*, July) ; Homfray's Sts. (*G. Rogers*).

Type in the Indian Museum, Calcutta.

Dr. Gravely has described the larva of this species taken

from a Popita tree at Bom lungta, Andaman Is. (Rec. Ind. Mus. xii, 1916, p. 143).

166. **Macrolinus sikkimensis.** (Plate XXIII, fig. 18.)

Basilianus sikkimensis Stoliczka, Journ. Asiat. Soc. Bengal xlii, 2, 1873, p. 161.
Macrolinus sikkimensis Gravely, Mem. Ind. Mus. iii, 1914, p. 243, pl. 13, fig. 42.

Elongate, a little flattened above, almost devoid of hair above and beneath, the tibiæ with very short and inconspicuous hair-fringes. The club of the antenna consists of three not very long lamellæ preceded by three very short ones. The *head* is closely and rugosely punctured and finely setose, the frontal area short and broad, the frontal ridges bisinuate, meeting in an acute angle, the marginal processes very sharp-pointed. The *pronotum* is short and convex, without median groove or with only a slight vestige, but with numerous close deep punctures at the sides, in and near the deep lateral scars and near the front angles. The dorsal striæ of the *elytra* bear very distinct fine close punctures and the sides bear narrow costæ connected by close transverse bars. The *prosternum* is opaque behind the front coxæ. The *mesosternum* has a finely rugose patch in the middle and the deep lateral scars are opaque. The *metasternum* has a narrow, finely rugose lateral depression, the anterior angles of the median area are very closely and finely punctured and the hind angles coarsely and confluently punctured.

Length, 27 to 32 mm.; *breadth*, 10 to 11 mm.

Bengal: Pankabari, 1500 ft. (*Stoliczka*). Assam: Patkai Hills (*W. Doherty*); Lohit Valley, Mishmi Hills, 1000 to 3000 ft. (*R. J. Kaulback* and *F. Kingdon Ward*, Mar.). N.E. Burma: Sen Bin Ti (*Dr. Murray Stuart*, Feb.).

Type in the Indian Museum, Calcutta.

var. **tavoyanus** Gravely, Mem. Ind. Mus. iii, 1914, p. 243.

This differs from the typical phase only in having the lateral scars of the mesosternum more or less punctured. The author mentions an intermediate specimen from Assam and anticipates that the transition will be found to be complete.

Burma: Dawna Hills, 900 to 2500 ft. (*F. H. Gravely*). Tenasserim: Tavoy. Indo-China.

167. **Macrolinus crenatipennis.**

Macrolinus crenatipennis Kuw., Nov. Zool. v, 1898, p. 185; Gravely, Mem. Ind. Mus. iii, 1914, p. 244.

According to Gravely, this "differs from *M. rotundifrons* only in its smaller size, and in the extremely coarse puncturing of all the grooves of the elytra, the dorsal grooves of *M. crena-*

tipennis being as coarsely punctured as the lateral ones of *M. rotundifrons*." Only the two original specimens, which I have not seen, appear to be known.

Length, 21·5 mm. (according to *Gravely*).

CEYLON.

Type and *co-type* in the Berlin University Museum.

168. Macrolinus rotundifrons.

Macrolinus rotundifrons Kaup, Berl. Ent. Zeits. xv, 1871, suppl. p. 44 ; Gravely, Mem. Ind. Mus. iii, 1914, p. 244, pl. 13, fig. 43.
Tiberius rotundifrons Zang, Deutsche Ent. Zeits. 1905, p. 163.

Elongate and a little depressed, the head and the sides of the pro- and metasternum bearing short erect setæ, the middle tibiæ with thick hair-fringes. The three terminal lamellæ of the antenna are moderately long and the preceding three distinctly shorter. The *head* is closely and roughly punctured, the median tubercle rather sharp, the frontal area triangular and almost equilateral, the frontal tubercles rather strong, the marginal processes acute, the left one more so than the right. The *pronotum* has a strong complete median groove and there are scattered punctures before and behind the lateral scar as well as a small crowded group of punctures near the front angle. The lateral grooves of the *elytra* bear numerous fine but distinct punctures. The median area of the *metasternum* has its hind angles coarsely rugose.

Length, 29 to 31 mm. ; *breadth*, 11 mm.

CEYLON : Matale (*R. Senior-White*, March) ; Kandy (*G. B. Longstaffe*, Feb., *E. E. Green*, Sept.) ; Peradeniya (*E. E. Green*, Oct.).

Type in the Darmstadt Museum.

M. rotundifrons is abundant in rubbish-heaps in the Royal Botanic Gardens at Peradeniya.

169. Macrolinus waterhousei.

Macrolinus waterhousei Kaup, Berl. Ent. Zeits. xv, 1871, suppl. p. 43 ; Gravely, Mem. Ind. Mus. iii, 1914, p. 245, pl. 13, fig. 44.

Elongate and a little depressed, the head and the sides of the pro- and metasternum clothed with short inconspicuous setæ, the middle tibiæ with rather scanty fringes. The three terminal lamellæ of the antenna are long and the preceding three distinctly shorter. The *head* is rugosely punctured, the frontal area transverse, the frontal tubercles are close to the front margin and the marginal processes are acute. The *pronotum* is very smooth, with a complete fine median groove, but without punctures at the sides. The lateral grooves of the *elytra* are finely but distinctly punctured. The *mentum* is very smooth in the middle. The median area of the *metasternum* has the hind angles coarsely rugose.

Length, 32 to 33 mm. ; *breadth*, 12 mm.

Ceylon : Ratnapura District (according to *Gravely*).

Type ? in the Berlin Zoological Museum.

Differences noted by Gravely between this and *M. rotundifrons* in the puncturing of the mentum, depressions in the anterior angles of the thorax and the mesosternal scars, do not seem to be constant ; but the three specimens in the British Museum have markedly thinner fringes to the middle tibiæ and longer terminal lamellæ to the antennæ. One of the three specimens is probably a co-type of the species.

170. **Macrolinus obesus.** (Plate XXIII, fig. 12.)

Macrolinus obesus Gravely,* Mem. Ind. Mus. vii, 1918, p. 80, fig. 9 (1).

Rather short, very convex, not parallel-sided, the elytra fused together and immovable, with rounded sides. The middle tibia bears a fairly long and close brush of hairs upon the upper surface. The club of the antenna consists of three moderately long lamellæ and three very short ones. The *head* is rather smooth, with only a very few punctures and almost destitute of hairs. The front margin is straight, the marginal processes are symmetrical and triangular, the median process rather sharply elevated, the frontal ridges strongly bisinuate, forming an acute angle, and rather wide apart in front, where they are united by a sharp curved carina. The eyes are small, the supraorbital ridges short and rounded. The labrum is shining and bears only a few setigerous punctures. The *pronotum* is relatively long and has a very slight incomplete median groove and a fine lateral groove, which extends only a short distance along the front and hind margins. There are a very few punctures in the front angles and in the lateral scar, which is very small. The *elytra* are rather narrow at the shoulders, dilating behind and fairly broad beyond the middle. They are deeply sulcate, with convex intervals, the dorsal grooves are very minutely punctured, the lateral grooves broad and finely but conspicuously punctured. The *mentum* is strongly punctured at the sides and the base has an oval impression on each side and a few punctures in the middle. The *metasternum* is widely and densely punctured at the sides and coarsely and closely on each side of the base.

Length, 33 mm. ; *breadth*, 12 mm.

Ceylon : Belihul-oya (*I. Z. Kannegieter*, April to June).

Type in the Indian Museum, Calcutta ; *co-type* in the British Museum.

As indicated by the abbreviated and rounded elytra, this is one of the flightless species, which in some parts of the world are fairly numerous.

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ADDENDA AND CORRIGENDA.

Addenda.

On page 88, after 28. *Dorcus curvidens.* (Plate VII, fig. 7) *add* Plate IX, fig. 8.

On page 135, after 64. *Dorcus elegans.* (Plate XI, fig. 20) *add* Plate XV, fig. 1.

Corrigenda.

On page 22, in line 12, *for* Plate II, fig. 7, *read* fig. 5 *c*.
,, ,, 18, *for* fig. 5, *read* fig. 5 *a*.
,, ,, 23, *for* fig. 6, *read* fig. 5 *b*.

On page 50, after 6. *Lucanus villosus for* Plate V *read* Plate IV.

On page 116, after 49. *Dorcus curvipes for* Plate VI, fig. 1 *read* Plate VIII, fig. 1.

On page 204, after 115. *Calcodes baladeva for* Plate XXI, figs. 1–3 *read* Plate XVIII, figs. 1–3.

PLATE I.

Fig. 1.	*Calcodes burmeisteri*		(Hope),	♂.
2.	,,	,,	,,	♂.
3.	,,	,,	,,	♂.
4.	,,	,,	,,	♀.

PLATE II.

Fig. 1 *a–h*. *Dorcus reichei* (Hope).
2. *Calcodes siva* (Hope & Westw.).
3 *a–d*. *Calcodes carinatus* (Linn.).
4 *a–i*. *Dorcus suturalis* (Oliv.).
5 *a–c*. *Dorcus polymorphus*, sp. n.

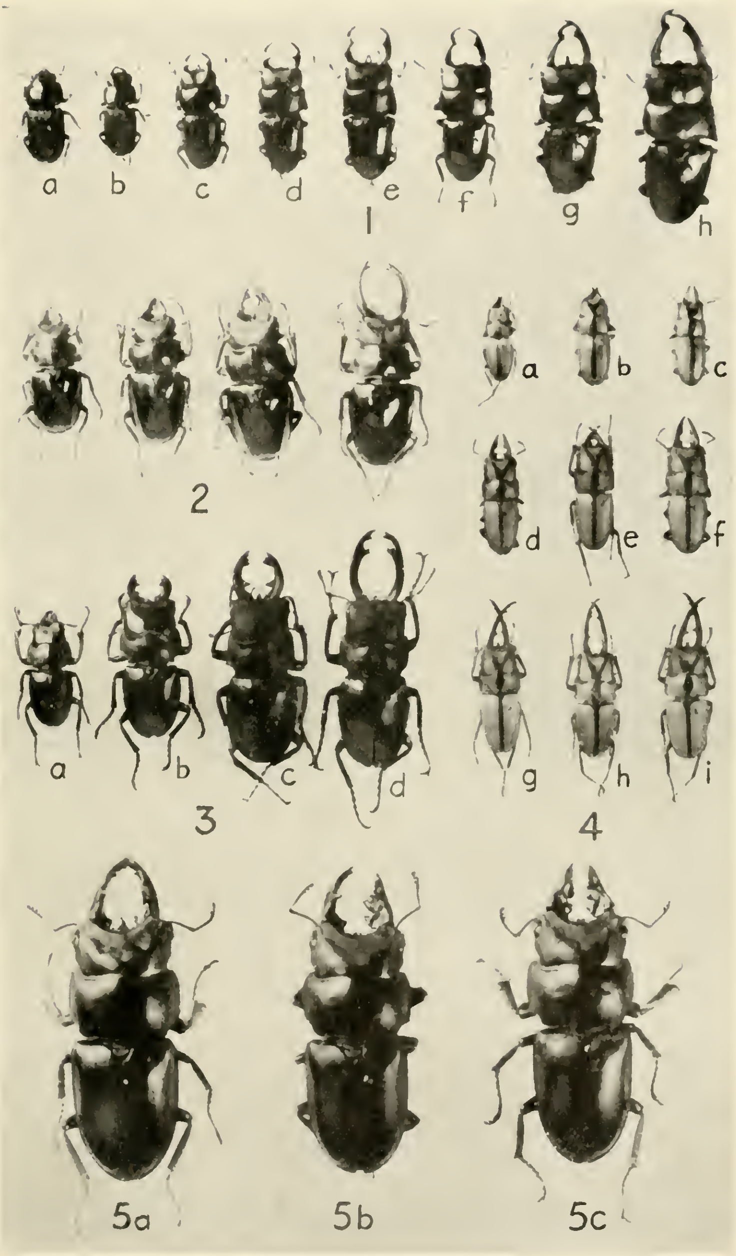
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PLATE III.

Fig. 1. *Lucanus cantori* Hope, ♂.
2. *Lucanus mearesi* Hope, ♀.
3. *Lucanus lunifer* Hope, ♂.
4. *Lucanus furcifer*, sp. n., ♂.
5. *Lucanus laminifer* Wat., ♂. (Type.)
6. *Lucanus mearesi* Hope, ♂.

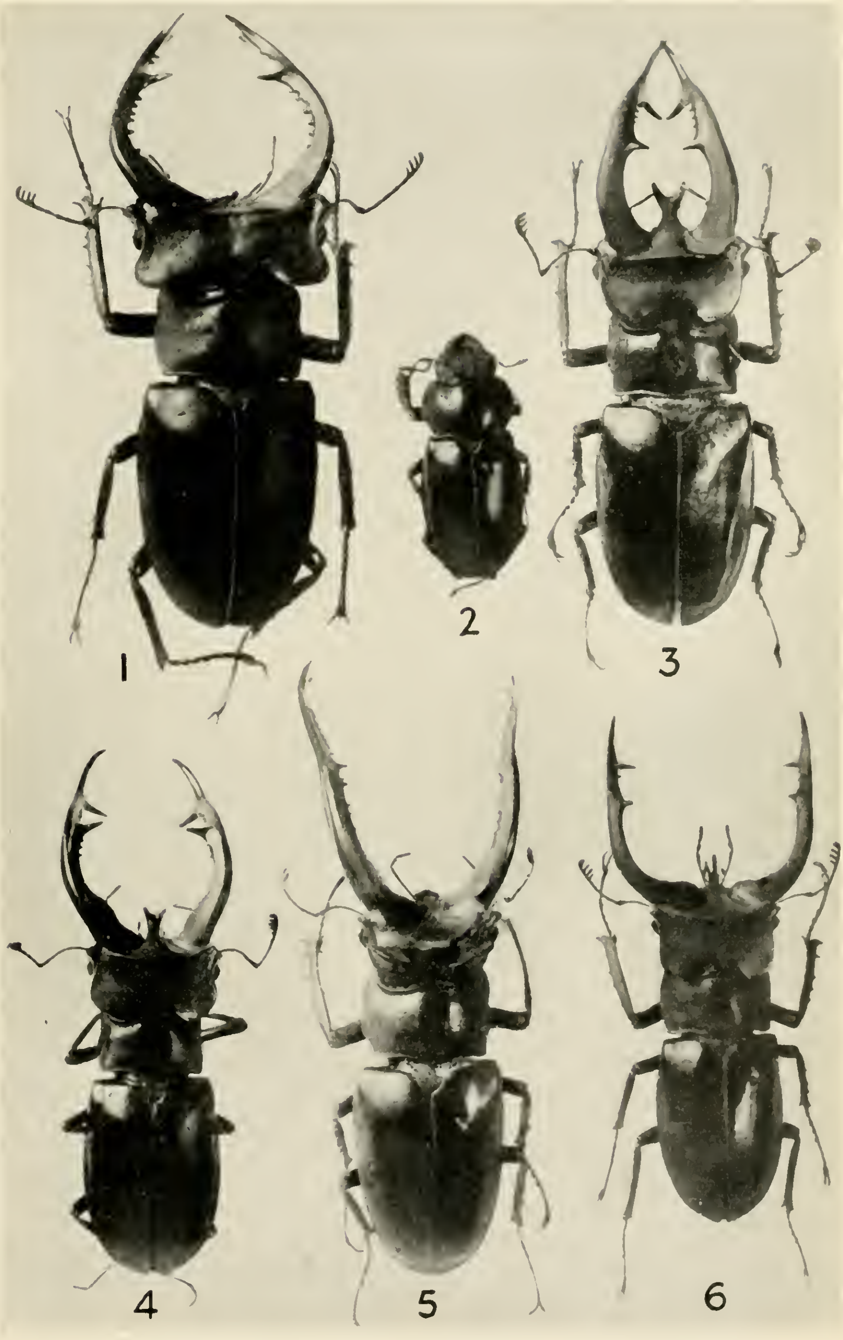
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PLATE IV.

Fig. 1. *Lucanus villosus* Hope, ♂. (Type.)
2. *Lucanus westermanni* Hope & Westw., ♂.
3. *Lucanus fryi* Boil., ♂.
4. *Lucanus smithi* Parry, ♂.
5. *Lucanus fairmairei* Planet, ♂.
6. *Lucanus lesnei* Planet, ♂.
7. *Lucanus atratus* Hope, ♀.
8. ,, ,, ,, ♂.
9. *Lucanus fortunei* Saund., ♀.
10. *Lucanus lesnei* Planet, ♀.

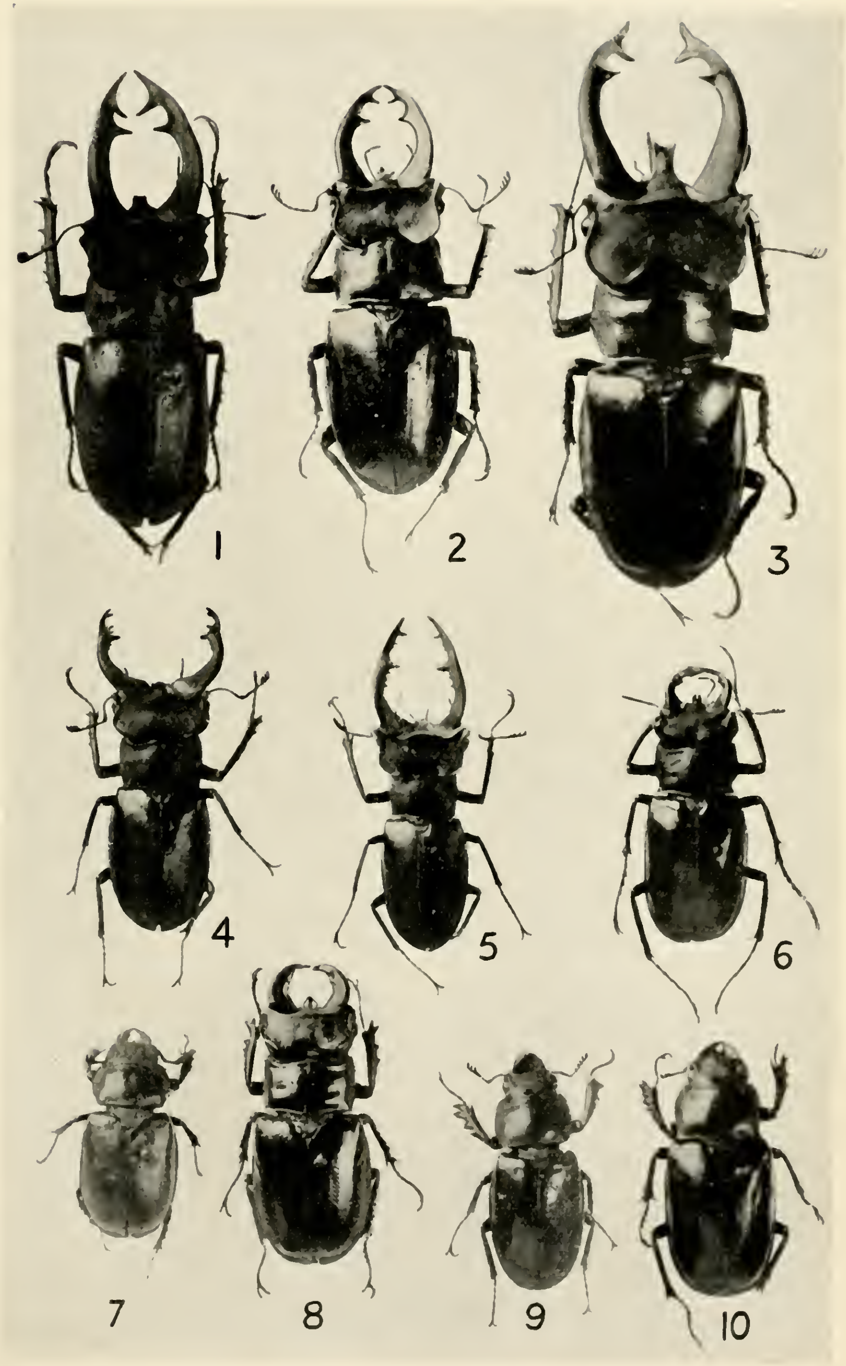
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PLATE V.

Fig. 1. *Lucanus lunifer* Hope, ♂.
2. *Lucanus laminifer* Wat., ♀.
3. *Lucanus fryi* Boil., ♀.
4. *Lucanus cantori* Hope, ♀.
5. *Hexarthrius forsteri* (Hope), ♀.
6. *Hexarthrius parryi* Hope, ♀.
7. *Lucanus smithi* Parry, ♀.
8. *Lucanus gracilis* Albers, ♂.
9. *Cyclommatus albersi* Kraatz, ♂.
10. ,, ,, ,, ♀.
11. *Cyclommatus strigiceps* (Westw.), ♂.

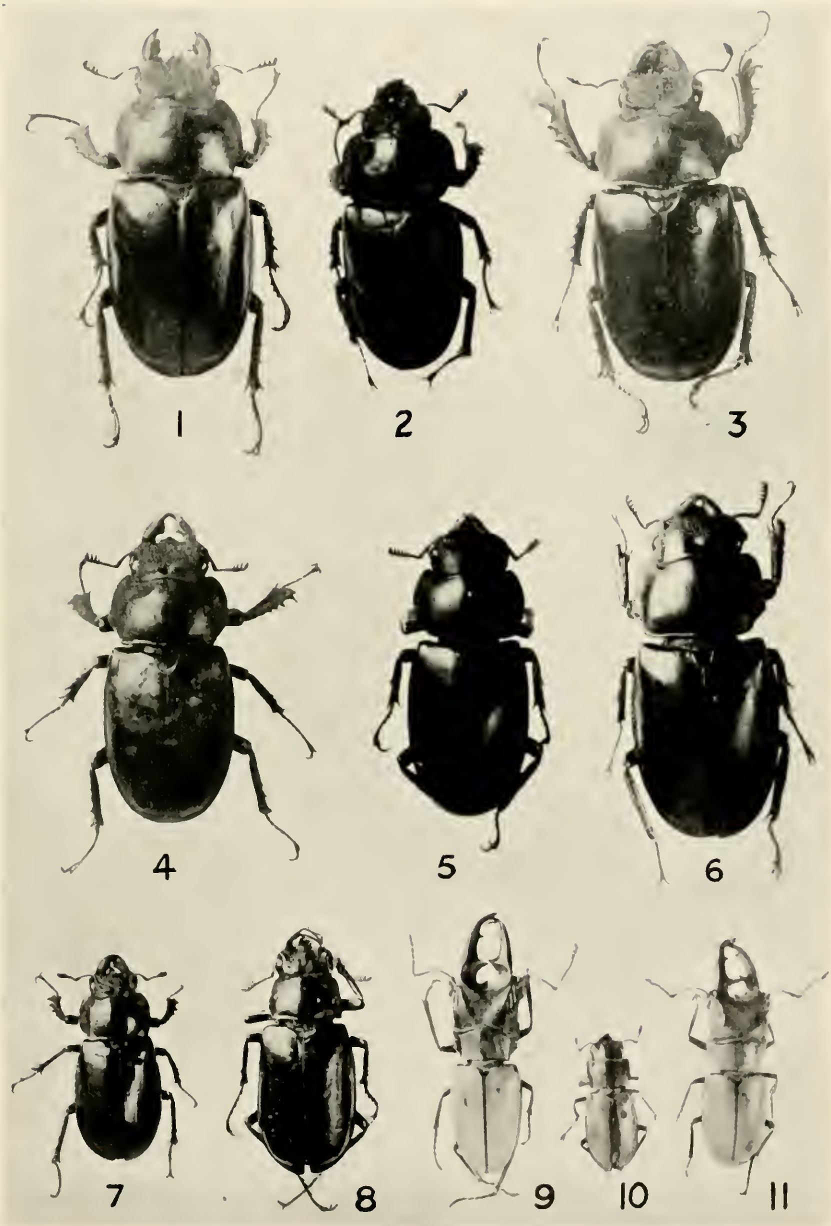
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PLATE VI.

Fig. 1. *Hexarthrius forsteri* Hope, ♂.
2. *Hexarthrius aduncus* Jord., ♂.
3. *Hexarthrius parryi* Hope, ♂.
4. *Hexarthrius davisoni* Wat., ♂.
5. *Hexarthrius mniszechi* Thoms., ♂.
6. *Hexarthrius bowringi* Parry, ♂. (Type.)

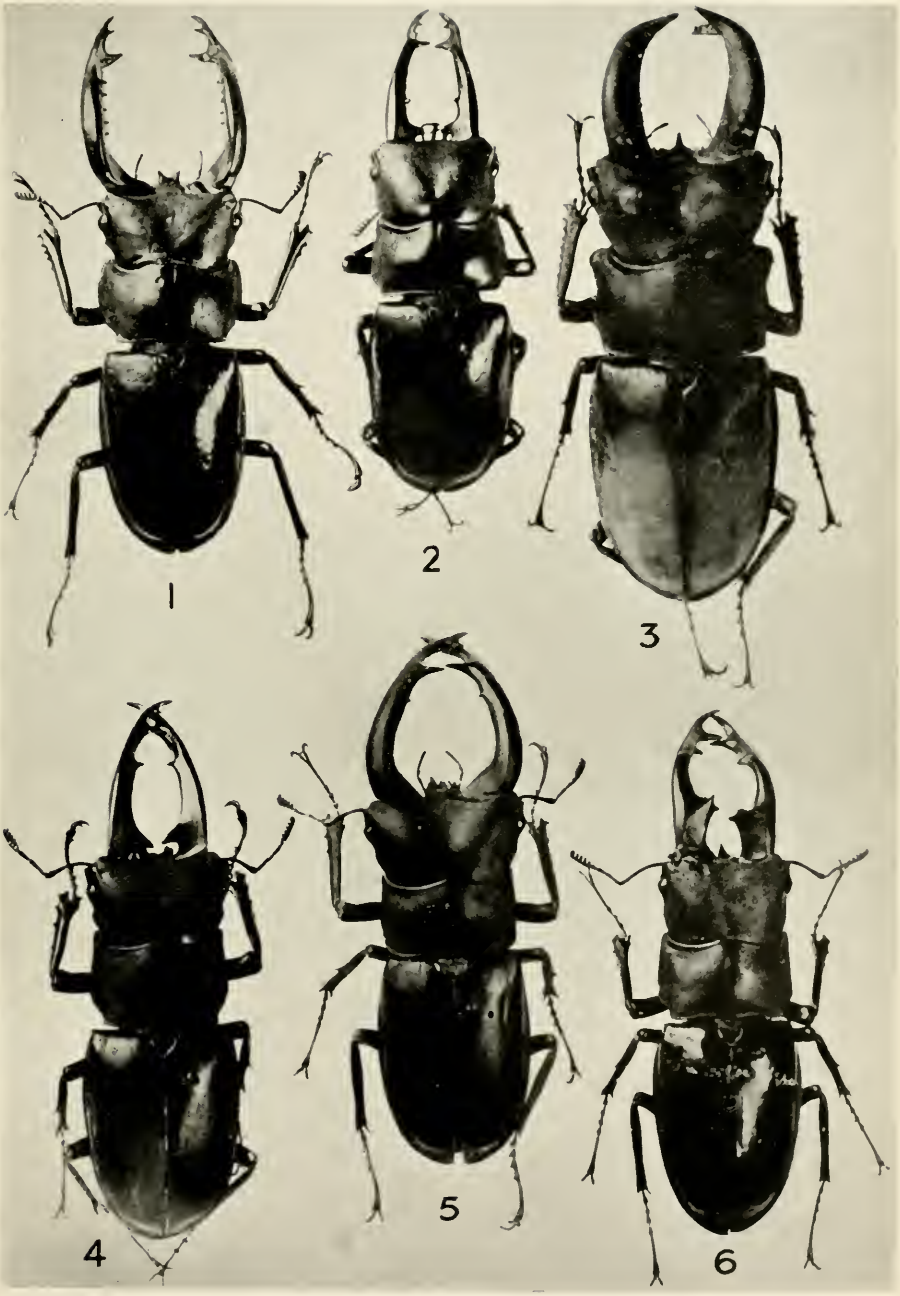
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PLATE VII.

Fig. 1. *Dorcus titanus* (Boisd.), ♂.

2. ,, ,, ,,
3. ,, ,, ,, f. *platymelus* Saund.
4. ,, ,, ,, ♀.
5. *Dorcus antæus* Hope, ♂.
6. ,, ,, ,,
7. *Dorcus curvidens* (Hope), ♂.

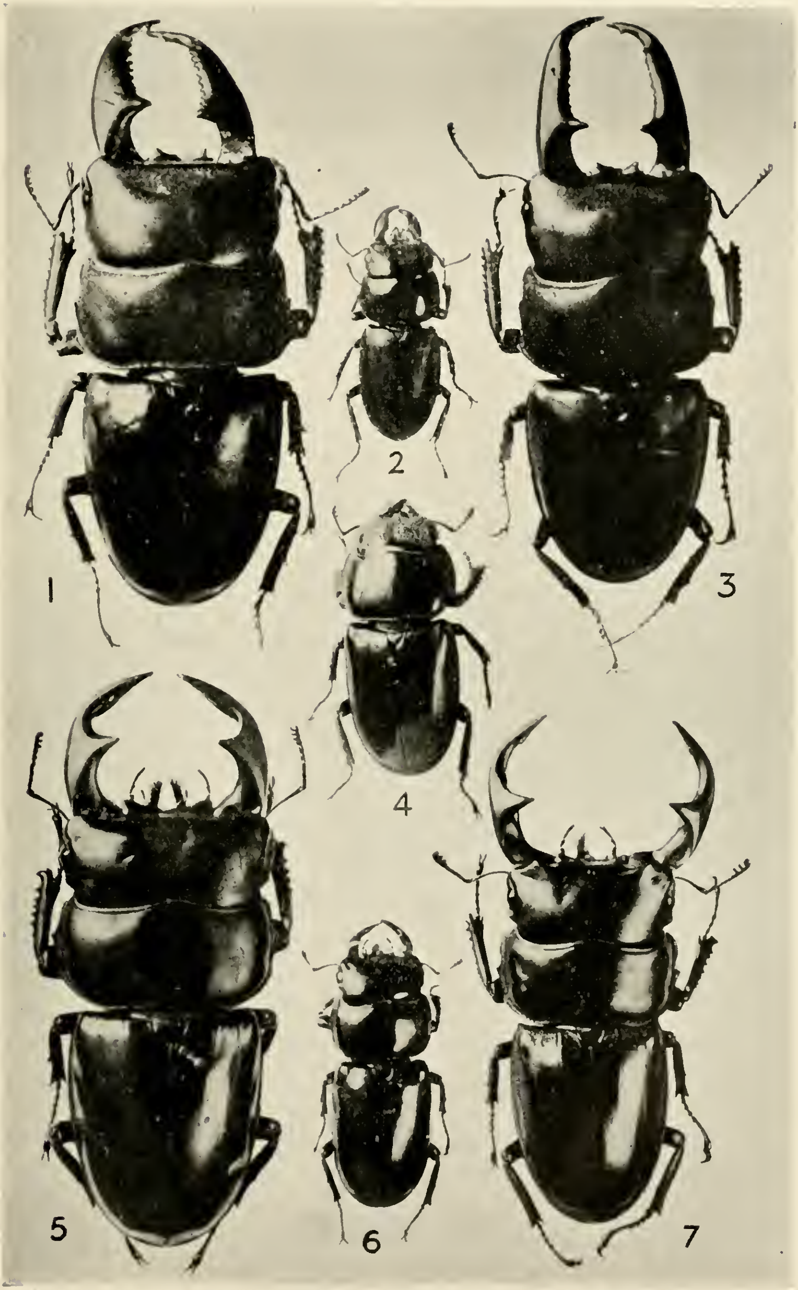
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PLATE VIII.

Fig. 1. *Dorcus curvipes* (Hope & Westw.).
2. *Dorcus tityus* Hope, ♂. (Type.)
3. ,, ,, ,, ♂.
4. ,, ,, ,, f. *tethys* Did., ♂.
5. ,, ,, ,, ♂.
6. ,, ,, ,, ♀.
7. *Dorcus reichei* (Hope), ♂. (*præcellens* Moll., Type.)
8. ,, ,, ,, ♂.
9. ,, ,, ,, ♀.
10. *Dorcus hyperion* Boil., ♂.

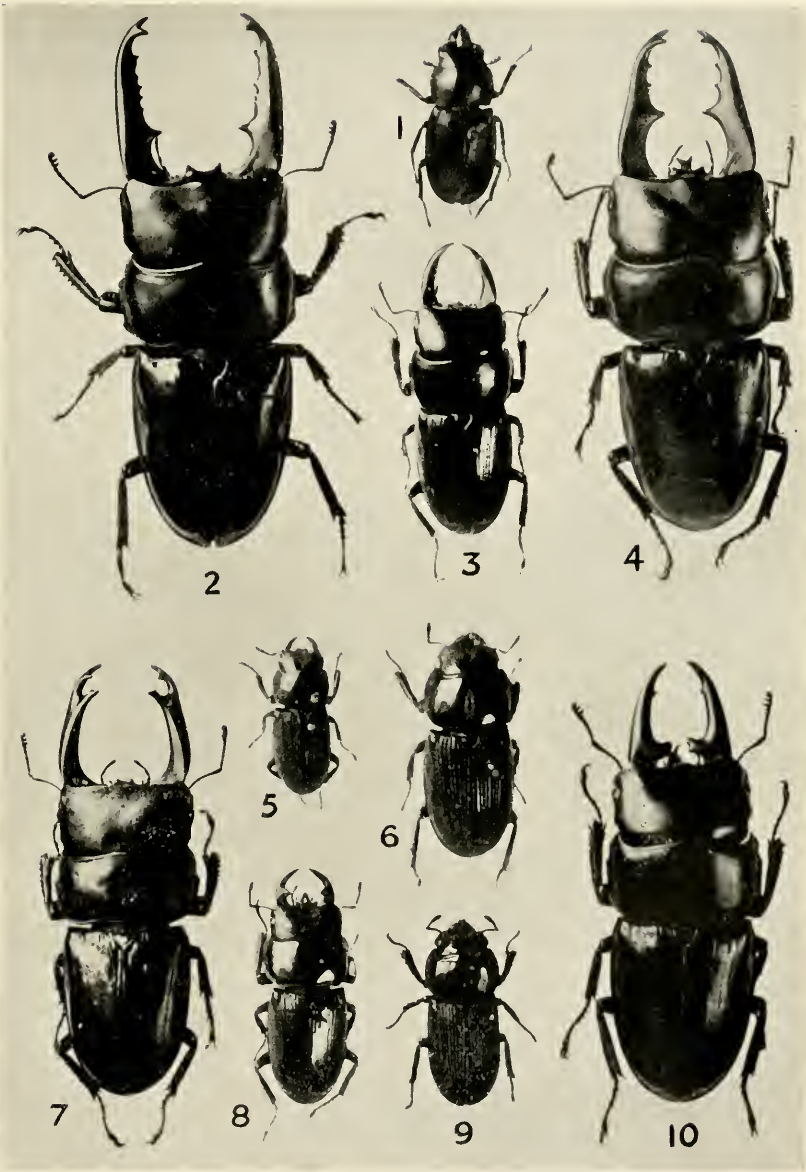
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PLATE IX.

Fig. 1. *Dorcus polymorphus*, nom. nov., ♂, isolated phase.
2. ,, ,, ,, ♂, variable phase.
3. *Dorcus derelictus* Parry, ♂.
4. ,, ,, ,, ♀.
5. *Dorcus spencei* (Hope), ♂. (Type), isolated phase.
6. ,, ,, ,, f. *mordax* Boil.
7. *Dorcus politus* (Parry), ♂. (Type.)
8. *Dorcus curvidens* Hope, ♀.
9. *Dorcus submolaris* (Hope & Westw.), ♂.
10. *Dorcus opacipennis* Zang., ♂.
11. ,, ,, ,, ♀.
12. *Dorcus ratiocinativus* Westw., ♂.

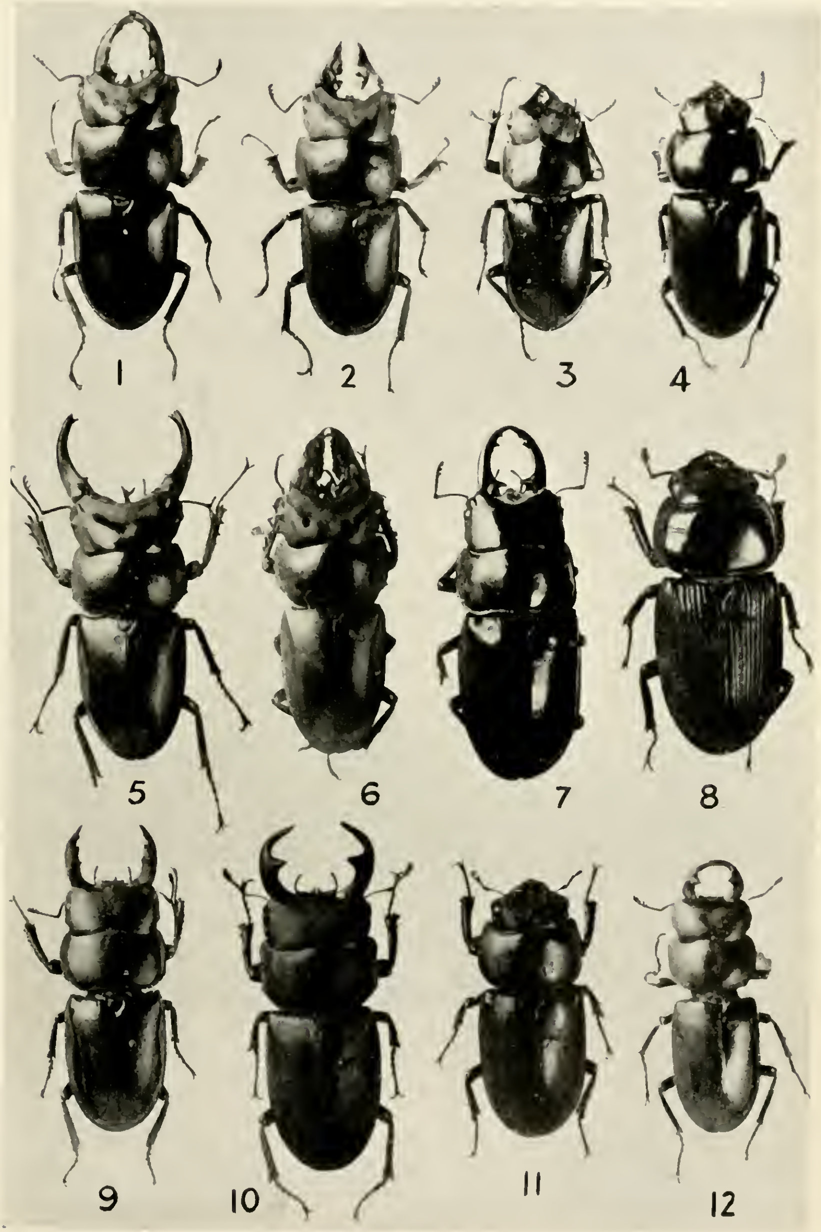
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PLATE X.

Fig. 1. *Dorcus oweni* (Hope & Westw.), ♂.
2. ,, ,, ,, ♀.
3. *Dorcus bulbosus* (Hope), ♂.
4. ,, ,, ,, ♀.
5. *Dorcus passaloides* (Hope & Westw.), ♂.
6. *Dorcus macclellandi* (Hope), ♂.
7. ,, ,, ,, ♂.
8. *Dorcus jenkinsi* (Westw.), ♂.
9. *Dorcus feai* (Boil.), ♂.
10. ,, ,, ,, ♂.
11. *Dorcus boreli* (Boil.), ♂.
12. *Dorcus cilipes* (Thoms.), ♂.

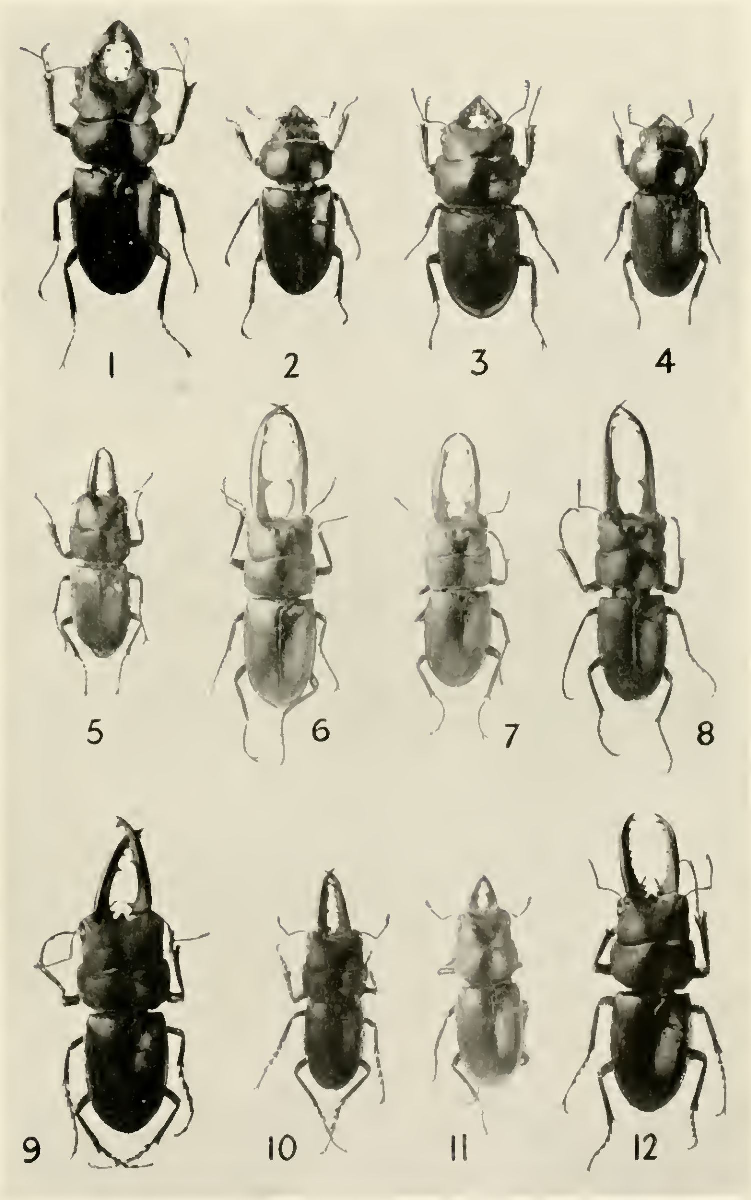
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PLATE XI.

Fig. 1. *Dorcus biplagiatus* (Westw.), ♂.
2. ,, ,, ,, ♂.
3. ,, ,, ,, ♀.
4. *Dorcus speciosus* (Boil.), ♂.
5. ,, ,, ,, ♀.
6. *Dorcus inquinatus* (Westw.), ♂.
7. ,, ,, ,, ♀.
8. *Dorcus suturalis* (Oliv.), ♂.
9. ,, ,, ,, ♂.
10. ,, ,, ,, ♂, isolated phase.
11. *Dorcus occipitalis* (Hope & Westw.), ♂.
12. ,, ,, ,, ♀.
13. ,, ,, ,, var. *ræpstorffi* Wat., ♀.
14. *Dorcus wimberleyi* (Parry), ♂.
15. ,, ,, ,, ♀.
16. *Dorcus histrio* Arrow, ♂. (Type.)
17. *Dorcus bisignatus* (Parry), ♂.
18. *Dorcus fulvonotatus* (Parry), ♂.
19. *Dorcus prosopocœloides* (Houlb.), ♂.
20. *Dorcus elegans* (Parry), ♂.

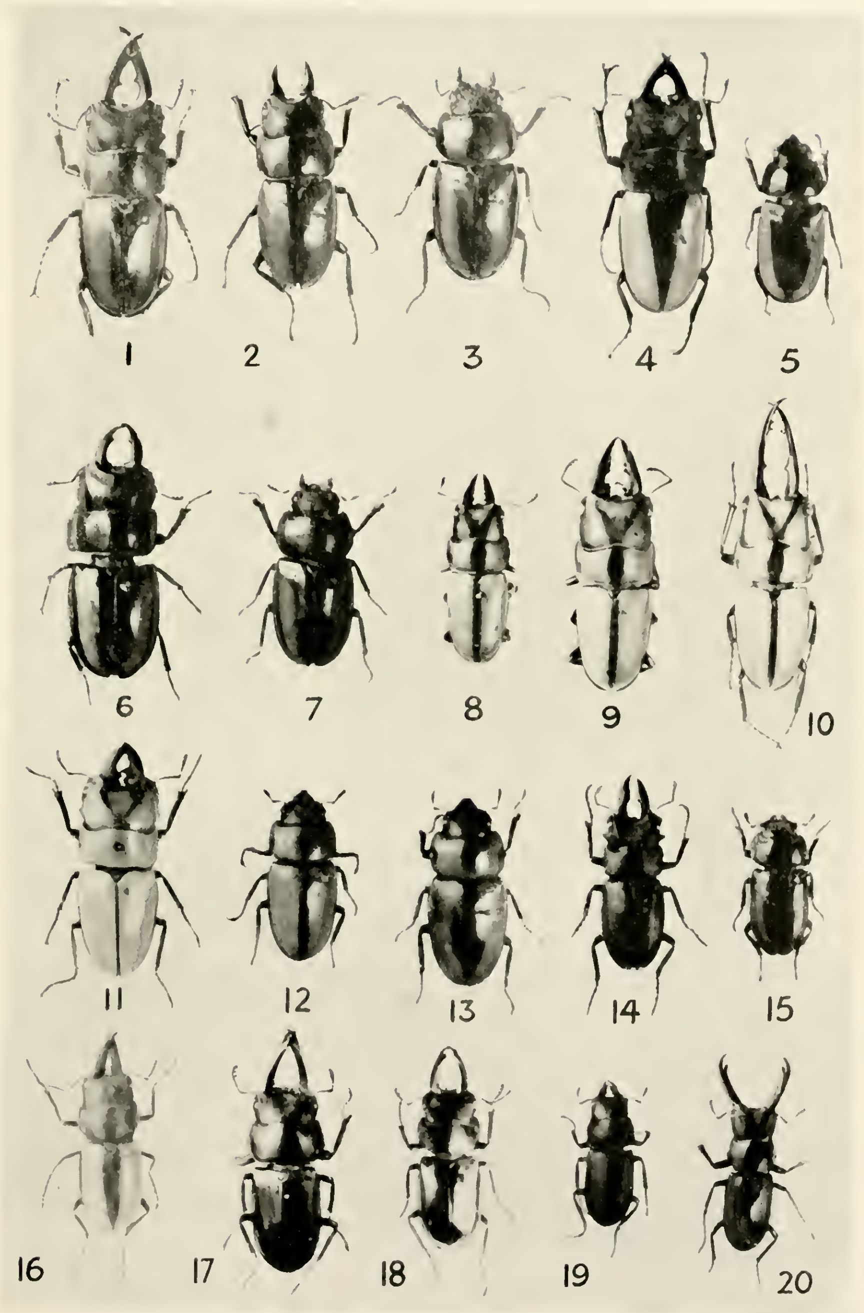
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PLATE XII.

Fig. 1. *Dorcus platycephalus* (Hope), ♂.
2. *Dorcus lucidus* (Boil.), ♂.
3. ,, ,, ,, ♂.
4. *Dorcus castaneicolor*, nom. nov., ♂.
5. *Dorcus henryi* Arrow, ♂. (Type.)
6. *Dorcus dentifer* (Deyr.), ♂.
7. *Dorcus groulti* (Planet), ♂.
8. *Dorcus subnitens* (Parry), ♂.
9. *Dorcus humilis* Arrow, ♂. (Type.)
10. *Dorcus cylindricus* Thoms., ♂.
11. *Dorcus ursulus* Arrow, ♂. (Type.)
12. *Dorcus velutinus* Thoms., ♂.
13. *Dorcus rugosus* Boil., ♂.
14. *Dorcus immundus* Arrow, ♂. (Type.)
15. *Dorcus candezei* (Boil.), ♂.
16. *Dorcus vernicatus* Arrow, ♂. (Type.)
17. *Dorcus nageli* Arrow, ♂. (Type.)
18. *Dorcus pouillaudei* (Houlb.), ♀. (Type.)
19. *Dorcus laterotarsus* (Houlb.), ♀.
20. *Dorcus rudis* (Westw.), ♂. (Type.)

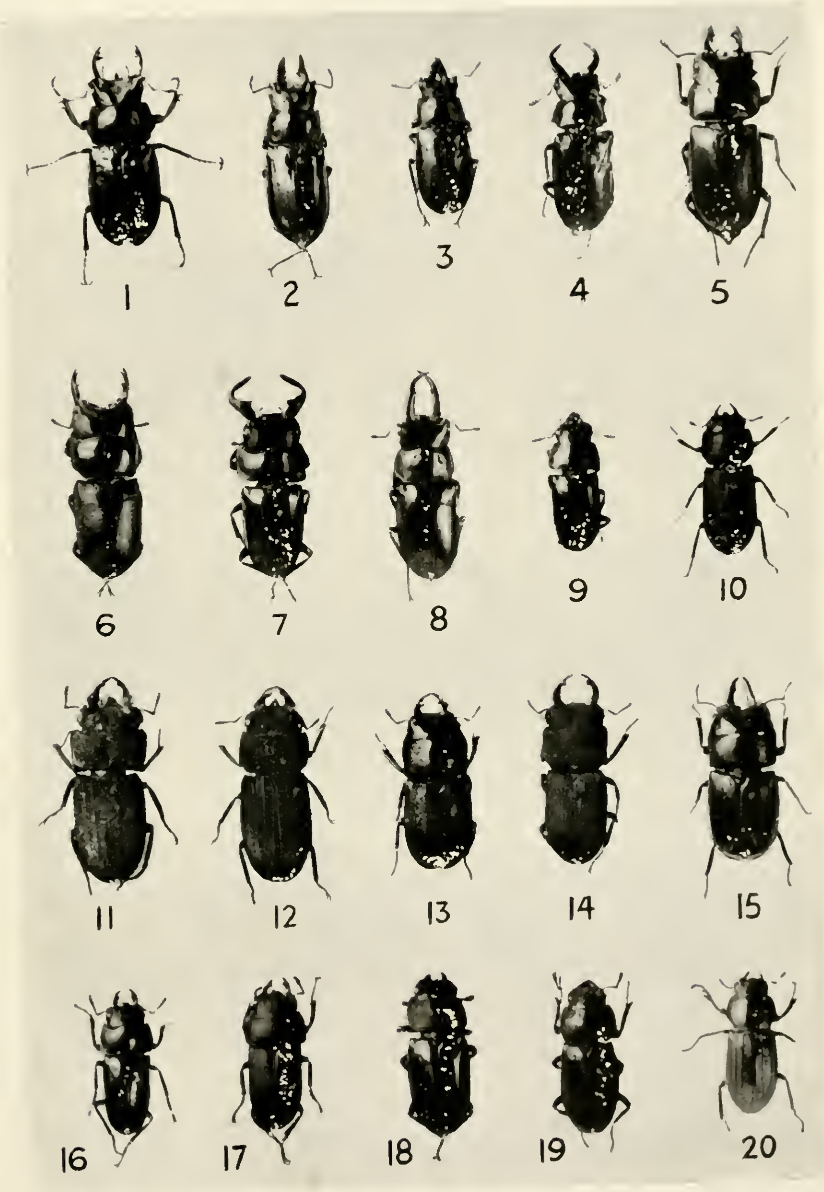

PLATE XIII.

Fig. 1. *Dorcus nepalensis* (Hope), ♂.
2. ,, ,, ,, ♂.
3. ,, ,, ,, ♀.
4. *Dorcus macleayi* (Hope & Westw.), ♂.
5. *Dorcus donckieri* (Boil.), ♂.
6. *Dorcus arrowi* (Boil.), ♂. (Type.)

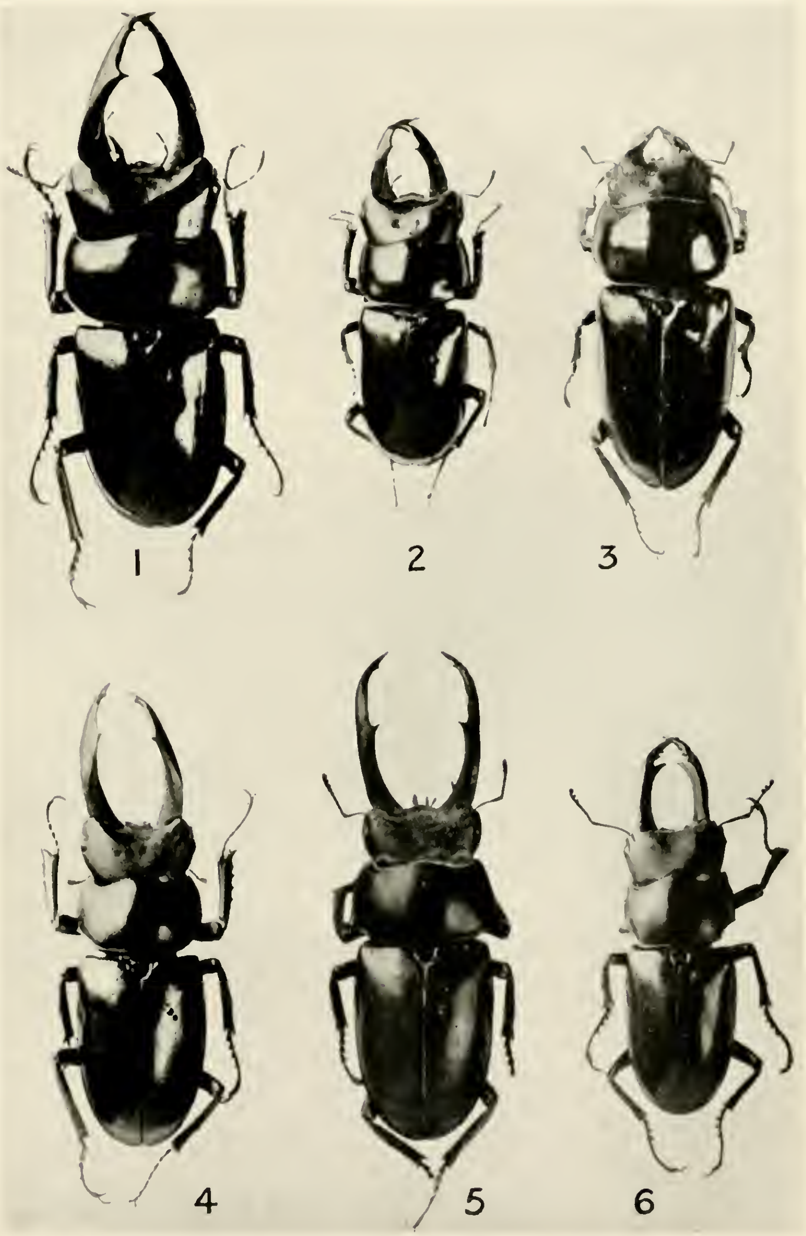

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PLATE XIV.

Fig. 1. *Dorcus giraffa* (Oliv.), ♂.
2. ,, ,, ,, f. *urrowi* Gravely, ♂.
3. *Dorcus westwoodi* (Parry), ♂.
4. *Dorcus giraffa* (Oliv.), ♂.
5. ,, ,, ,, ♀.
6. *Dorcus westwoodi* (Parry), ♀.
7. *Dorcus boileaui* (Did.), ♂.

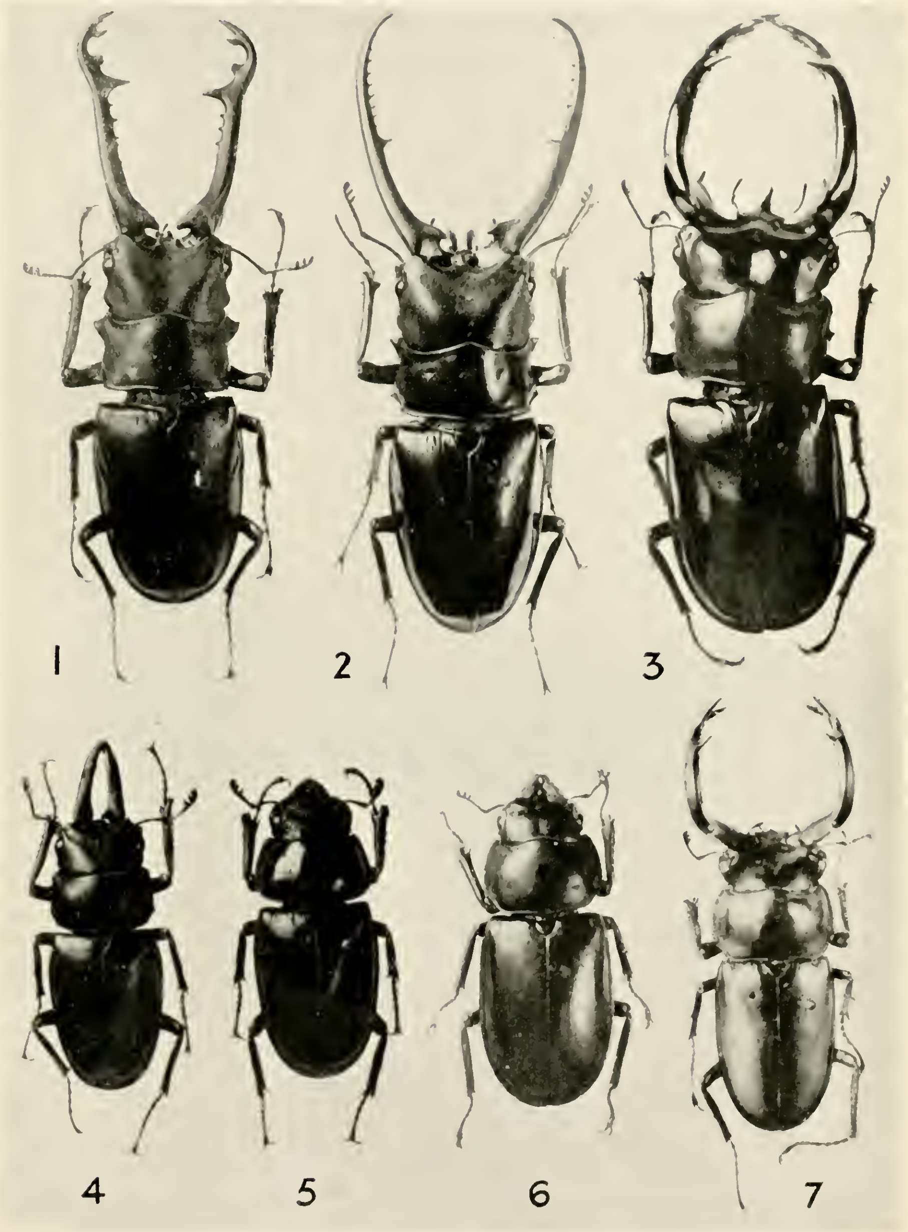
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PLATE XV.

Fig. 1. *Dorcus elegans* (Parry), ♂.
2. *Dorcus foveatus* (Hope), ♀.
3. ,, ,, ,, ♂. (Type of *impressus* Wat.)
4. ,, ,, ,, ♂.
5. ,, ,, ,, ♂.
6. ,, ,, ,, ♂.
7. ,, ,, ,, ♂.
8. *Dorcus buddha* (Hope), ♂.
9. ,, ,, ,, ♂.
10. ,, ,, ,, ♀.
11. *Gnaphaloryx opacus* Burm., ♂.
12. ,, ,, ,, var. *andamanus*, ♂.
13. ,, ,, ,, ♀.

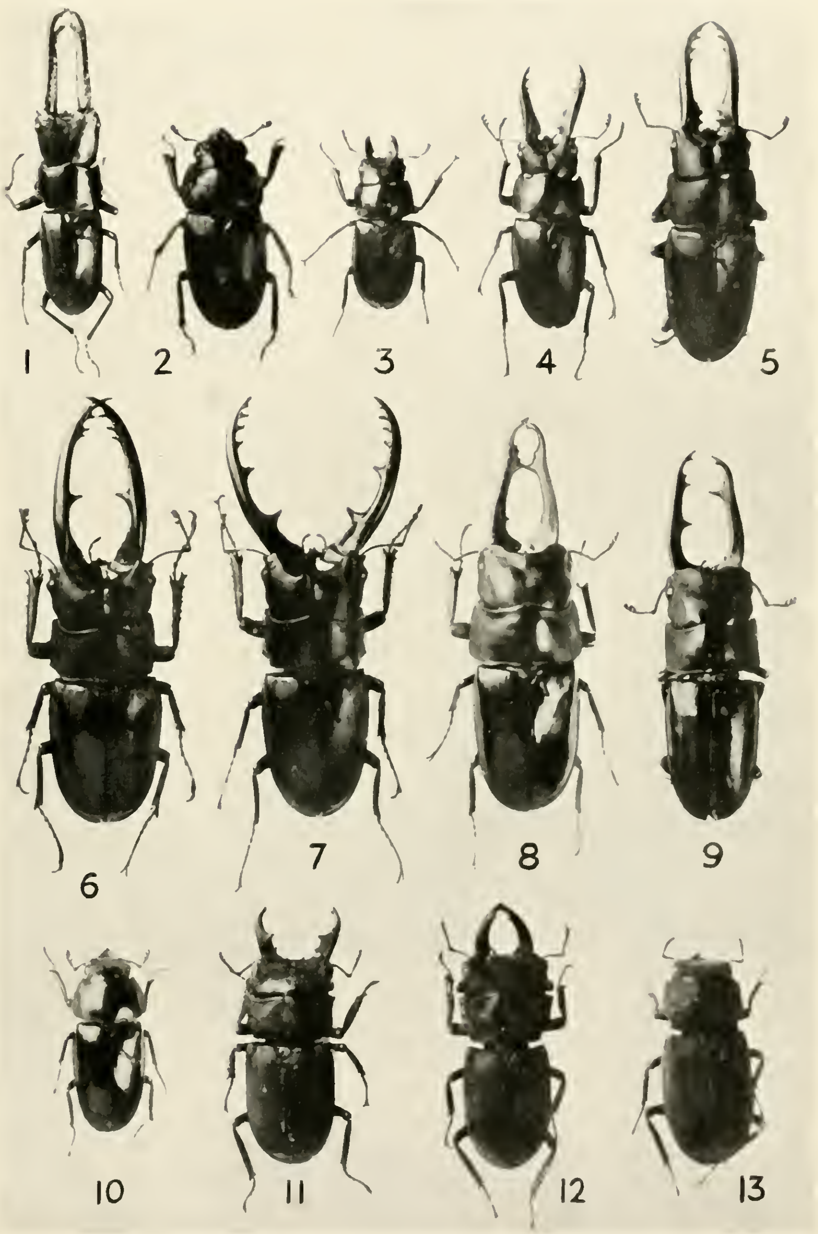
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PLATE XVI.

Fig. 1. *Calcodes sinensis* (Westw.), ♂, isolated phase.

2. ,, ,, ,, ♂.

3. ,, ,, ,, ♀.

4. *Calcodes mouhoti* (Parry), ♂.

5. ,, ,, ,, ♀.

6. *Calcodes burmeisteri* (Hope), ♀.

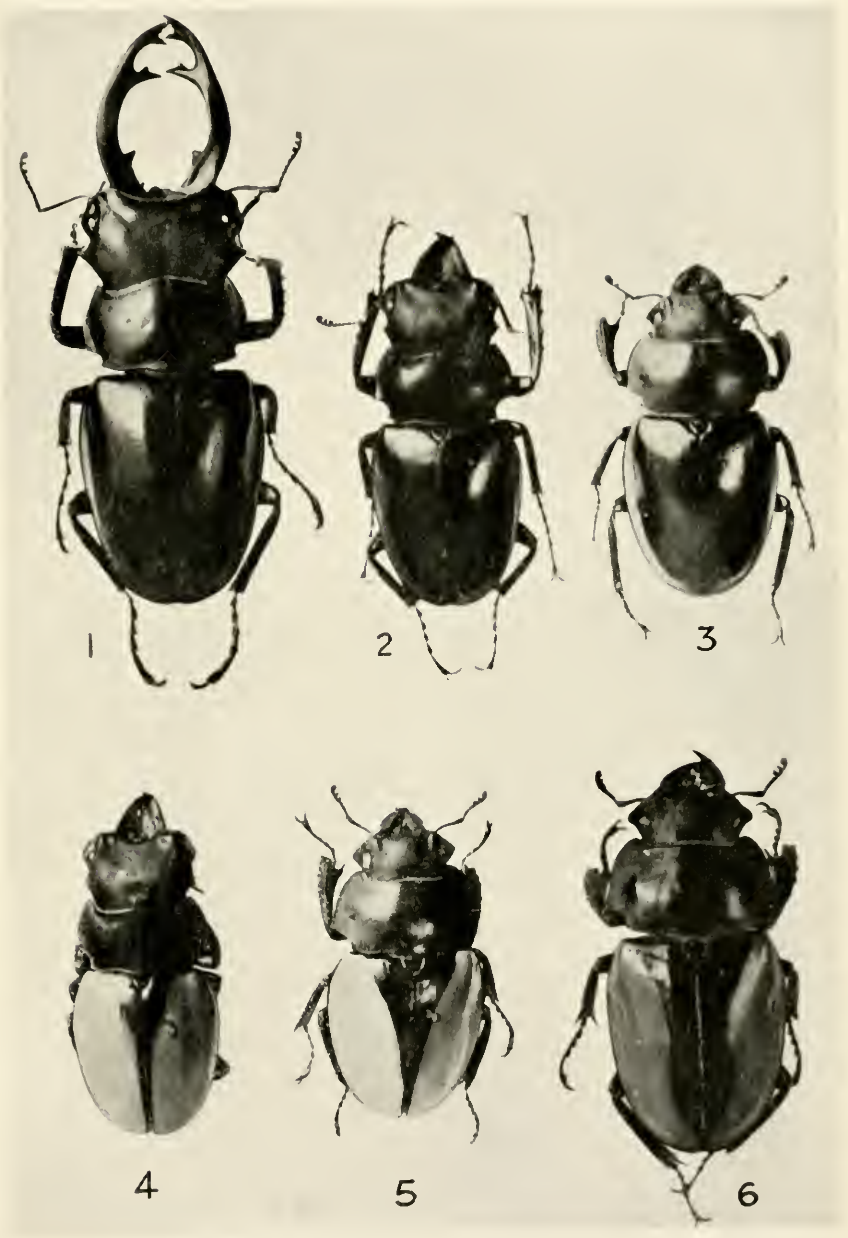
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PLATE XVII.

Fig. 1. *Calcodes delesserti* (Guér.), ♂.
2. *Calcodes burmeisteri* (Hope), ♂.
3. ,, ,, ,, ♂.
4. *Calcodes delesserti* (Guér.), ♂.
5. *Calcodes cuvera* (Hope), ♂.

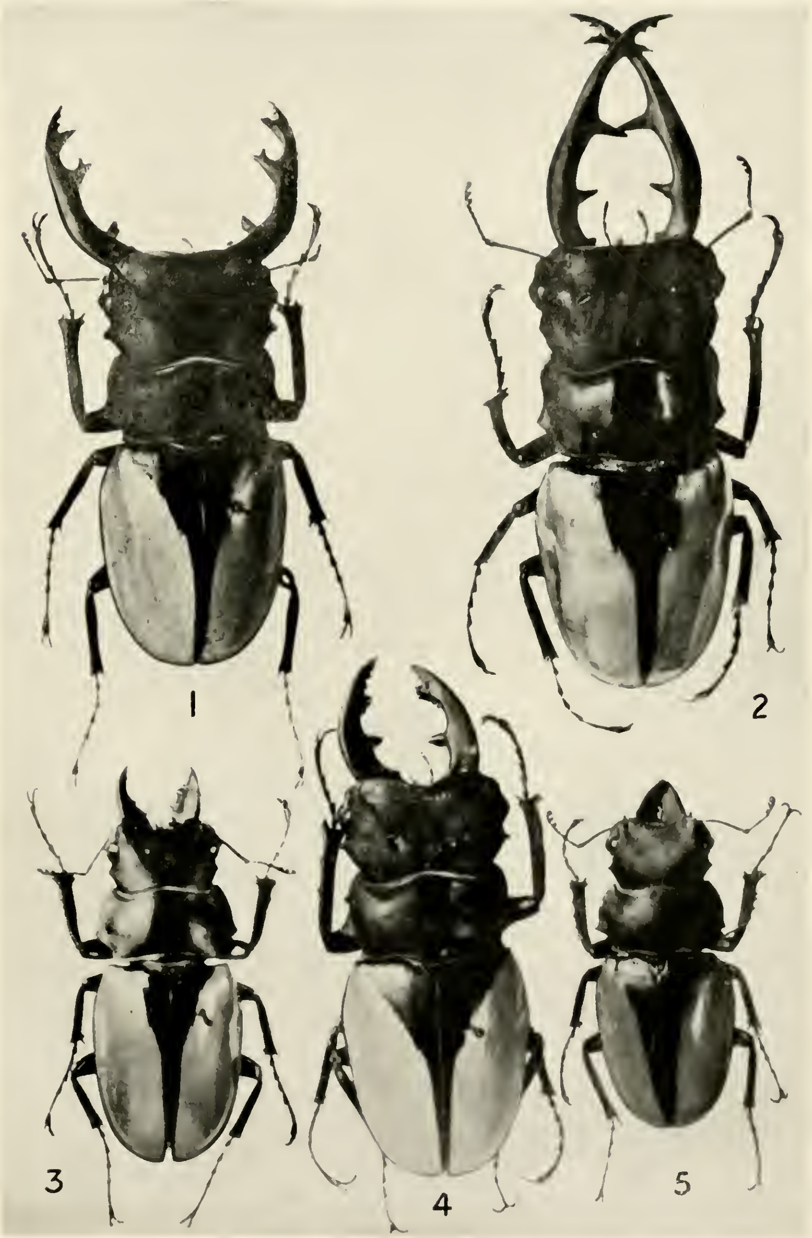
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PLATE XVIII.

Fig. 1. *Calcodes baladeva* (Hope), ♂.
2. ,, ,, ,, ♀.
3. ,, ,, ,, var. *saundersi* Parry, ♂.
4. *Calcodes cuvera* (Hope), ♂, isolated phase.
5. ,, ,, ,, ♂, var. *alticola* Moll., isolated phase.
6. *Calcodes elegans* (Moll.), ♂, isolated phase.

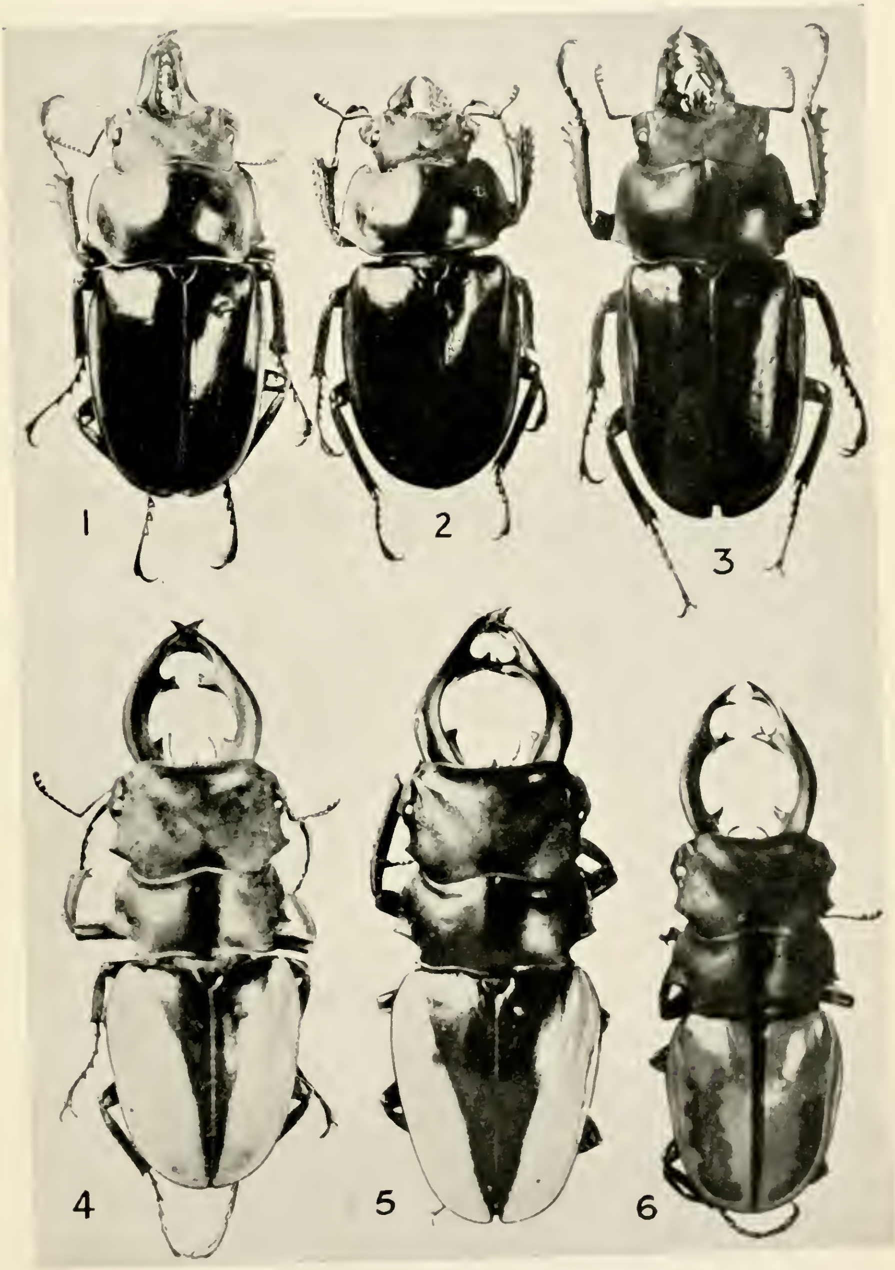
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PLATE XIX.

Fig. 1. *Calcodes siva* (Hope & Westw.), ♂, isolated phase.
2. ,, ,, ,, ♂, variable phase.
3. *Calcodes dalmani* (Hope & Westw.), ♂.
4. *Calcodes siva* (Hope & Westw.), ♂, variable phase.
5. ,, ,, ,, ♀.
6. *Calcodes dalmani* (Hope & Westw.), ♀.

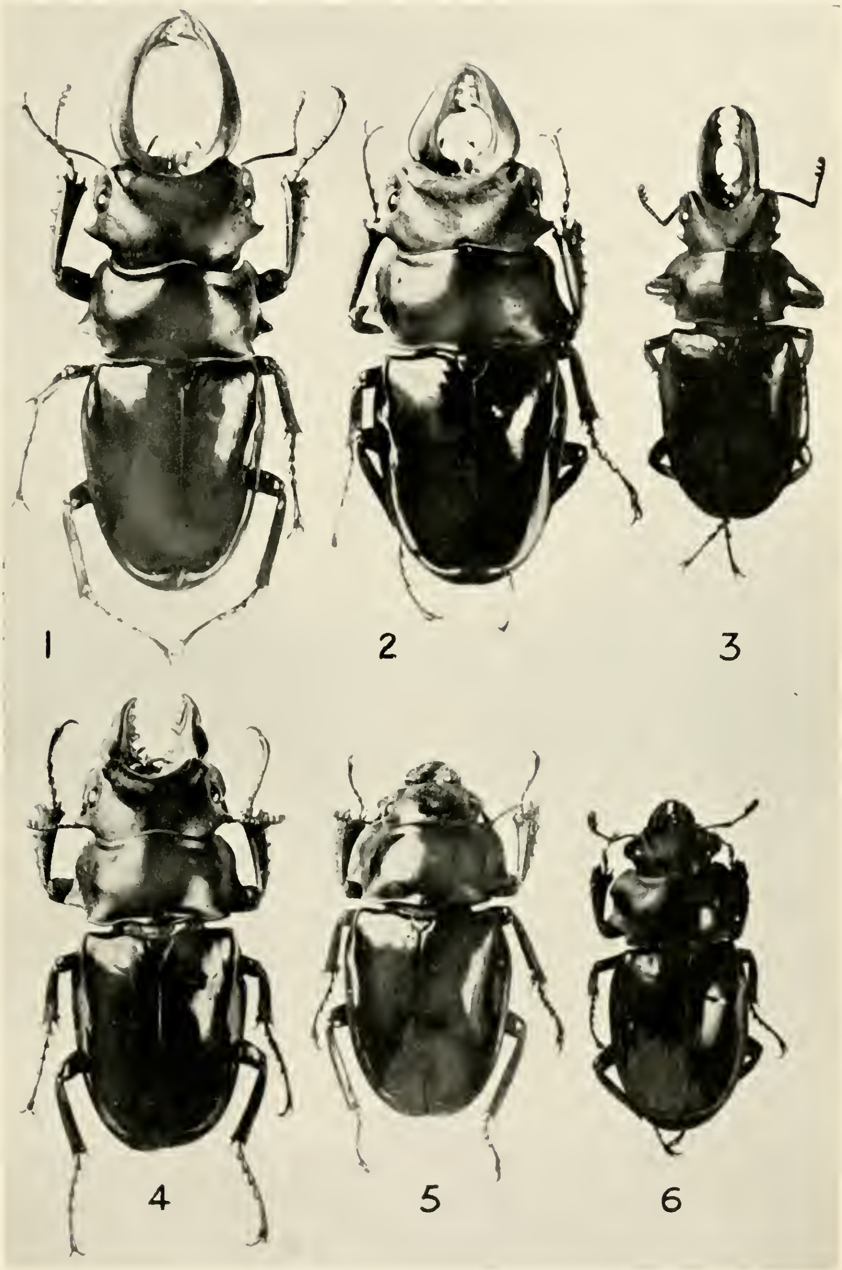
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PLATE XX.

Fig. 1. *Calcodes carinatus* (Linn.), ♂, isolated phase.
2. ,, ,, ,, ♂, variable phase.
3. ,, ,, ,, ♀.
4. *Calcodes versicolor* (Did.), ♂.
5. ,, ,, ,, ♀. (Type.)
6. *Calcodes parryi* (Leuthner), ♂.
7. ,, ,, ,, ♀.
8. *Calcodes æratus* Westw., ♂, variable phase.
9. ,, ,, ,, ♂.
10. ,, ,, ,, ♂, isolated phase.
11. ,, ,, ,, ♀.
12. *Calcodes marginatus* (Wat.), ♂.

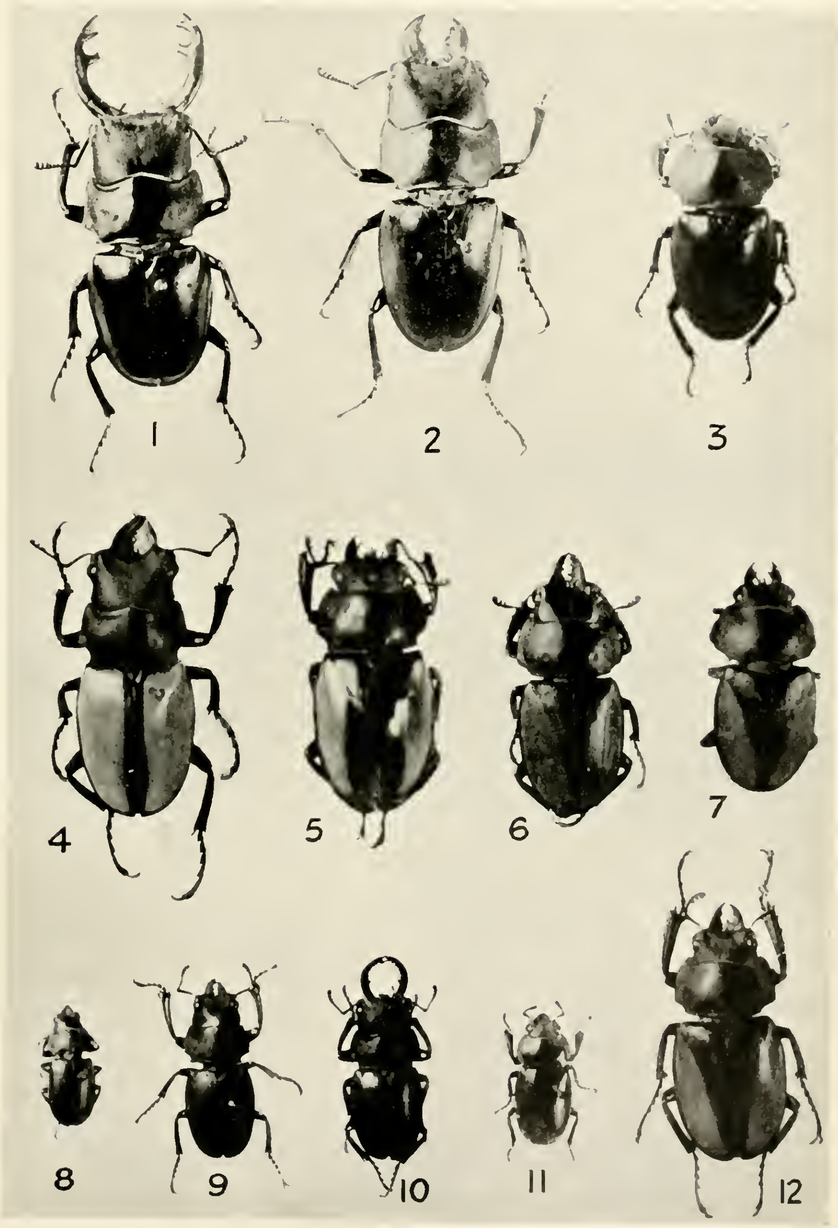
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PLATE XXI.

Fig. 1. *Calcodes platynotus* (Hope & Westw.), ♂.
2. ,, ,, ,, ♀.
3. *Calcodes latus* (Boil.), ♂.
4. *Calcodes robustus* (Boil.), ♂.
5. *Calcodes castanopterus* (Hope), ♂.
6. ,, ,, ,, ♀.
7. *Aulacostethus archeri* Wat., ♂. (Type.)
8. ,, ,, ,, ♂.
9. *Calcodes brevis* (Boil.), ♂.
10. *Heterochthes andamanensis* Westw., ♂.
11. ,, ,, ,, ♂.
12. ,, ,, ,, ♀.

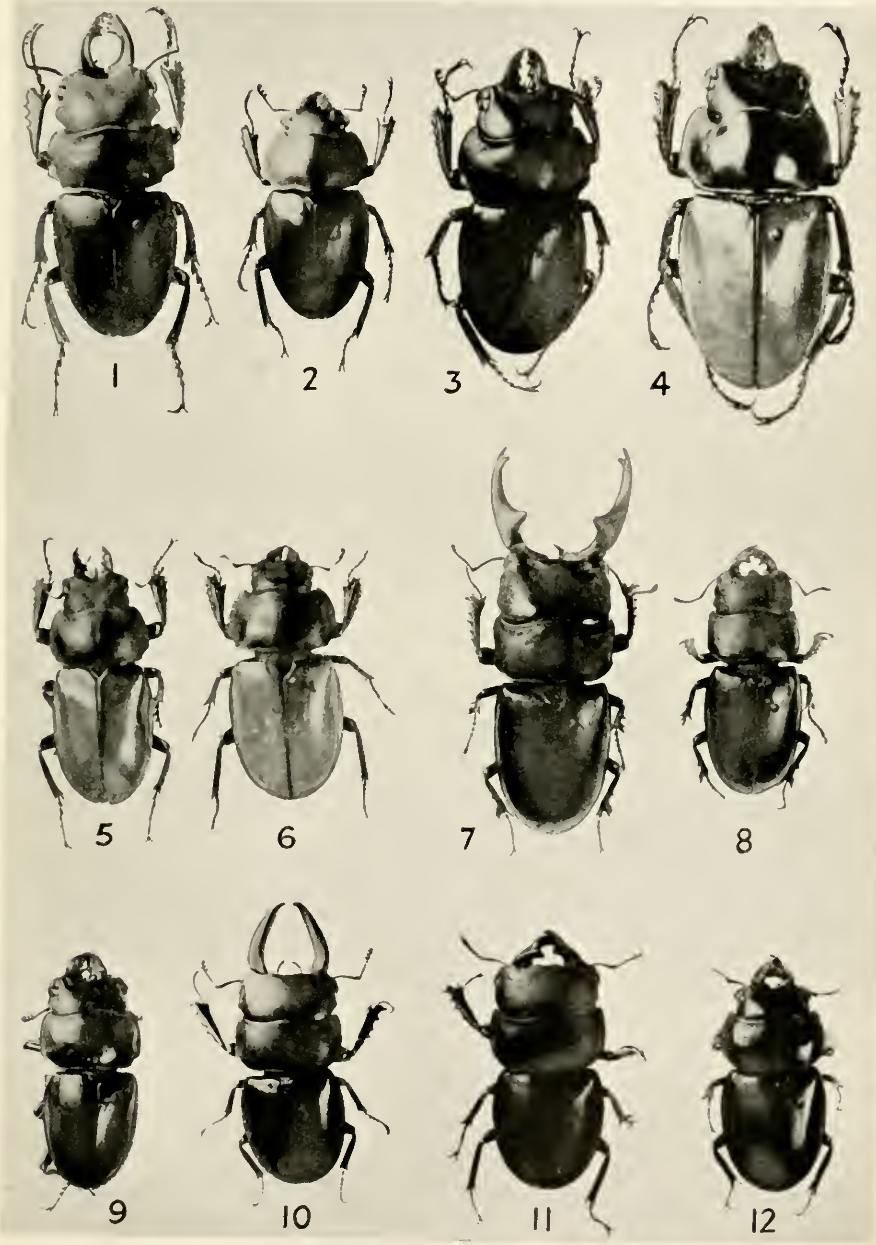
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PLATE XXII.

Fig. 1. *Figulus aratus* Arrow. (Type.)
2. *Figulus andamanus* Kriesche.
3. *Figulus caviceps* Boil.
4. *Figulus cicatricosus* Boil.
5. *Cardanus variolosus* Arrow. (Type.)
6. *Platyfigulus scorpio* Arrow. (Type.)
7. *Nigidius dawnæ* Gravely.
8. *Nigidius elongatus* Boil.
9. *Nigidius himalayæ* Gravely.
10. *Nigidius birmanicus* Boil. (Type.)
11. *Nigidius distinctus* Parry.
12. *Ægus kandiensis* Parry, ♂.
13. ,, ,, ,, ♂.
14. ,, ,, ,, ♀.
15. *Ægus labilis* Westw., ♂.
16. ,, ,, ,, ♀.
17. *Ægus parallelus* Hope & Westw., ♂.
18. ,, ,, ,, ♂.
19. ,, ,, ,, ♀.
20. *Ægus labilis* Westw., ♂. (Type.)

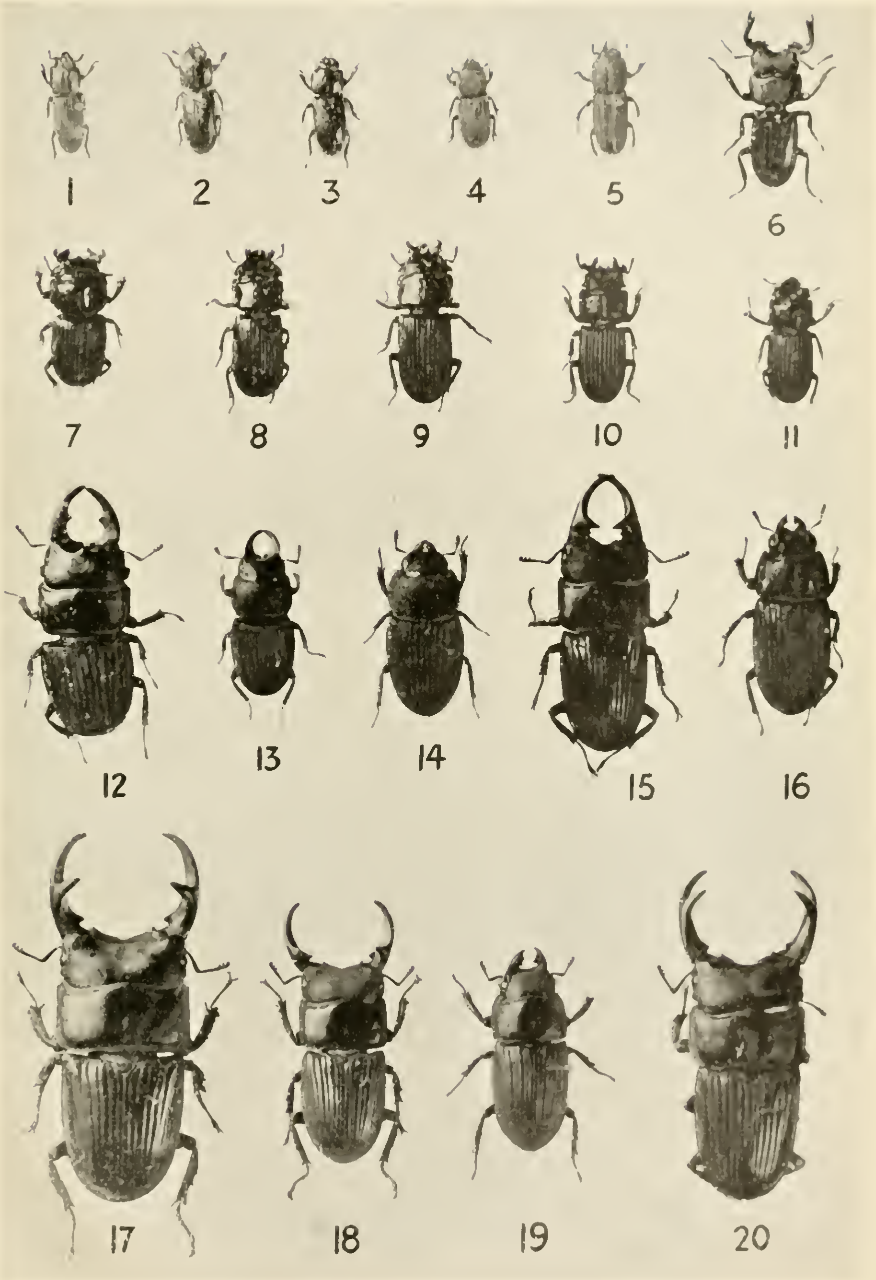
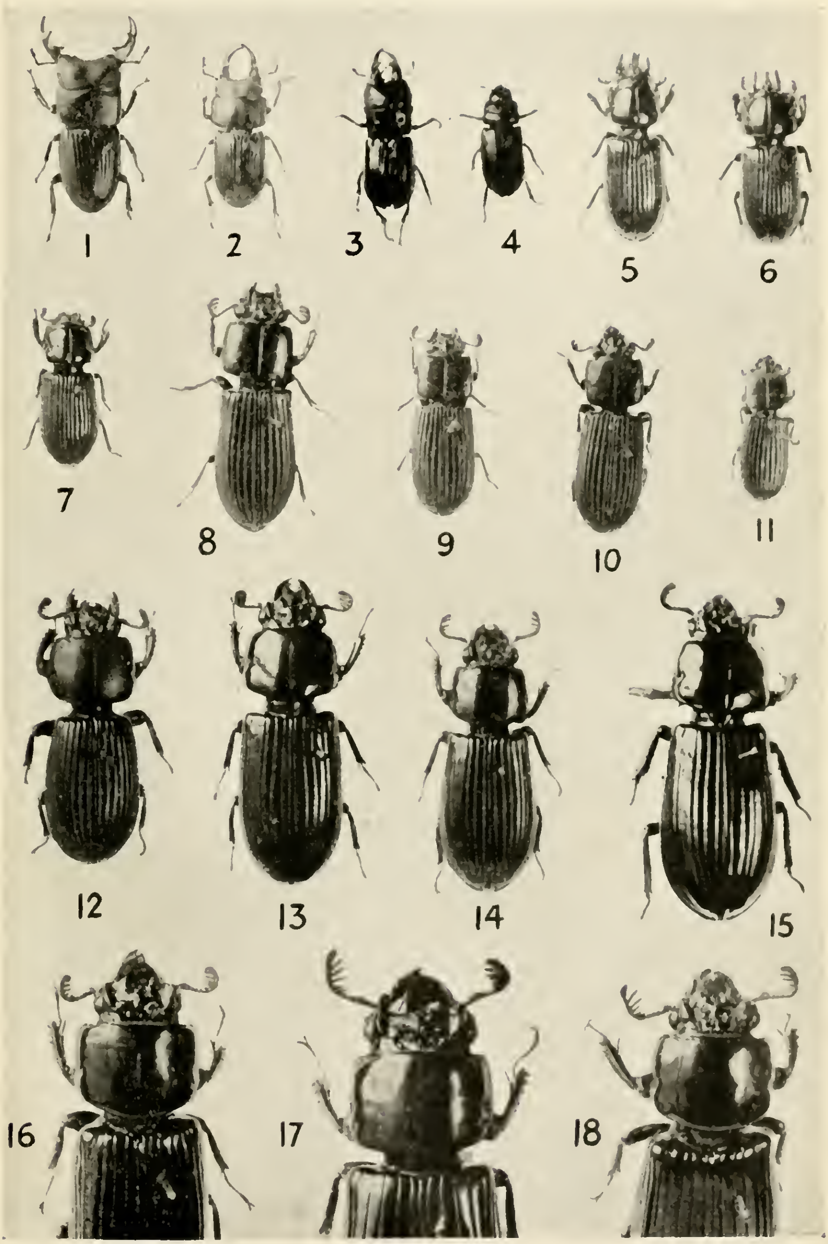


PLATE XXIII.

Fig. 1. *Ægus eschscholtzi* Hope & Westw., ♂. (Type.)
2. *Ægus linealis* Did.
3. *Ceruchus atavus* Fairm., ♂.
4. ,, ,, ,, ♀.
5. *Ceracupes fronticornis* (Westw.).
6. ,, ,, ,,
7. *Aulacocyclus bicuspis* Kaup.
8. *Leptaulax dentatus* (Fabr.).
9. *Leptaulax roepstorffi* Kuw.
10. *Leptaulax bicolor* (Fabr.).
11. *Leptaulax planus* (Ill.).
12. *Macrolinus obesus* Gravely.
13. *Episphenus comptoni* (Kaup.).
14. *Macrolinus andamanensis* (Stol.).
15. *Pleurarius brachyphyllus* Stol.
16. *Episphenus flachi* Kuw.
17. *Aceraius grandis* Burm.
18. *Macrolinus sikkimensis* (Stol.).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